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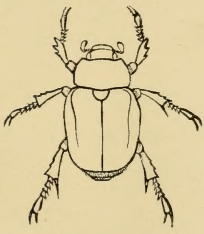

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ERRATA.

Page 5, line 9 from top, and page 6, line 6 from top, read Sphærophoria for Sphœrophoria.

Page 8, line 7 from top, read annu*li* for annulæ.

Page 18, line 22 from bottom, read 1.1 inch -27.5^{mm} for 1.1 inch 27.5^{mm}.

Page 20, line 24 from top, read O. simplex for O simplex.

Page 22, line 1 from bottom, read *all* for al.

Page 27, line 19 from top, read a*us* for ans.

Page 38, line 10 from bottom, read Cycadace*æ* for Cycadacea.

Page 40, lines 7 and 8 from bottom, read "extends so far north as the Caloosahatchie River. As this region is entomologically still *terra incognita*, I can, etc."

Page 43, line 4 from bottom, read "were obtained" for "issued."

Page 44, line 1 from top and 3 from bottom, read *schizoceratis* for *schizoceri.*

Page 51, line 21 from top, read *eruditus* for *eruditua.*

Page 56, line 14 from top, read W. J. Holland for W. G. Hall.

Page 56, line 16 from top, read Holland for Hall.

Page 81, line 20 from bottom, read *pallidella* Chamb. for *pallidella Chamb.*

Page 82, line 11 from top, read resemble for resemble*s*.

Page 82, line 13 from bottom, read "cilia with a" for "cilia a with."

Page 93 (facing) last line, read Insid*i*ous for Insid*u*ous.

Page 106, line 5 from top, read *poeyi* for *freyi.*

Page 110, line 10 from top, read method for mothod.

Page 116, line 7 from bottom, read ἀροτρον for ἄροτρον and οὐρα for οὐρά.

Page 116, insert "*a*" above upper figure; and add to explanation of figure, "*c*, uncus."

Page 137, line 12 from bottom, add after "Philadelphia," (Vol. I, p. 310.)

Page 137, line 11 from bottom, read *Thrips* for *Thrip.*

Page 140, line 13 from bottom, read *Triphleps* for *Thriphleps.*

Page 141, line 24 from top, read *ochraceus* for *ochraceous.*

Page 141, line 21 from bottom, read *graminis* for *gramineæ.*

Page 146, line 6 from top, read *Hind-wings* for *Head-wings.*

Page 153, line 9, from bottom, read 1886 for 1866.

Page 155, line 11 from top, read *Hippobosca* for *Hipposboca.*

Page 162, line 4 from top, read sixteenth for fifteenth.

Page 162, bottom line, read *flavipes* for *flaripes.*

Page 172, line 8 from top, read Mr. *Gade* for Mr. Harrington.

Page 187, line 7 from top, add comma after curved.

Page 187, line 25 from bottom, read punctate for unctate.

Page 187, line 14 from bottom, omit "sub-opaque" after "Elytra."

Page 192, line 8 from top, read *fervens* for *ferens.*

Page 195, line 17 from top, read "Anaphorinæ" for "Anophorinæ."

Page 198, line 6 from bottom, read *Cossonus* for *Cossomus.*

Page 200, line 11 from top, read 1888 for 1886.

Page 201, line 4 from bottom, read ichthyologists for icthyologists.

Page 208, line 5 from top, read Aptères for Aptéres.

Page 214, line 3 from top, read *Third* New York Report for Fourth New York Report.

Page 220, line 9 from bottom, read Sinoxylon for Dinoderus; and *S. floridanum* for *D. floridanum.*

Page 224, line 4 from top, read "996" for "3,296 [*sic*!]."

Page 228, line 11 from top, read season for sea-son.

Page 228, line 4 from bottom, read *sieglinge* for *seiglinge.*

Page 233, line 8 from bottom, read Coleopterous for Coleoterous.

Page 233, line 6 from bottom, read *Carpophilus dimidiatus* for *Carpophilus mutilatus.*

Pages 245, 247, and 248 read Noël for Nöel wherever the name occurs.

Page 254, line 20 from bottom, read "cinereous speckled, with fuscous" instead of "cinerous speckled, with fuseous."

Page 261, lines 11 and 12 from bottom read "a separate heading" for "the head of General Notes."

Page 275, line 8 from bottom, read .025 mm for .02½ mm.

Page 278, line 7 from bottom, read Dugès for Dugés.

Page 285, line 7 from top, read *Tyroglyphus* for *Tryoglyphus.*

Page 292, line 5 from bottom, and page 293, line 2 from top, read Nietner for Neitner.

Page 295, transfer heading at top of page to after line 3.

Page 301, line 10 from bottom, read a*n*d for ad.

Page 301, line 9 from bottom, omit the figures "114–116."

Page 301, line 11 from top, read Trichoptera for Thrichoptera.

Page 302, line 13 from top, read 147 for 143.

Page 302, line 9 from top, read) for (.

Page 302, line 22 from top, read *Wiener* for *Weiner.*

Page 303, line 2 of explanation to Fig. 67, read "dorsa*l* view" for "dorsa lview."

Page 305, line 9 from bottom, read Staphylin*i*dæ for Staphylindæ.

Page 314, line 2 from bottom, and page 315, line 1 from top, read Kühn for Kuhn.

Page 315, line 3 from top, read *kühniella* for *kuhniella.*

Page 319, line 23 from bottom, read Harr. for Haw.

Page 322, line 21 from top, read Gräsern for Gra'sern.

Page 325, line 1 from bottom, omit comma after "Commissioners."

Page 345, line 9 from top, read *larreæ* for *larreœ.*

Page 355, line 10 from bottom, read *kühniella* for *kuhniella.*

U. S. DEPARTMENT OF AGRICULTURE.

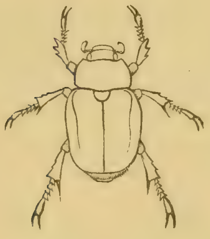
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. JULY, 1888.

Vol. I. No. 1.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS, WITH THE SANCTION OF THE COMMISSIONER OF AGRICULTURE.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1888.

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SALUTATORY.

Ever since our connection with the Division of Entomology we have greatly felt the need of some speedy and regular means of publication in which might be printed short articles, notes, reports of the progress of investigations, and brief papers on entomological subjects which are either too limited in scope or too disconnected to be used in the annual reports or in the special bulletins of the Division. A vast amount of interesting matter, especially in correspondence, has hitherto been buried in the archives of the Division which has had no medium of direct communication with the public, especially that portion which includes the student of entomology and the actual workers in economic entomology. Some of these miscellaneous notes have been published occasionally under the heads of "Notes of the Year" and "Extracts from Correspondence" in several of the special bulletins of the Division (viz: Nos. 2, 4, and 12) and in the annual reports for 1879 and 1884. But there is much matter of general interest that is necessarily omitted from any such publications appearing only at irregular intervals. A periodical bulletin in which matter of timely interest can be given to the public without delay, and especially to the agricultural journals for still wider distribution, has become the more necessary now that active experiment stations have been established under the Hatch bill in most of the States.

It is not necessary to explain to the public the difficulties which have heretofore been thrown in the way of publishing from the Division such a periodical bulletin as is here proposed. We have in past annual reports intimated the great need of something of the sort and believe that Commissioner Colman has instituted no reform during his administration that will be productive of more general good or will give more general satisfaction, so far as the interests of economic entomology are concerned.

We hope to make the periodical interesting and useful to all in any way concerned in entomology, and, without further comments or prom-

ises, we cordially invite such to co-operate with us in our endeavors. With the aid of those associated with us in Government work, particularly of Messrs. L. O. Howard, E. A. Schwarz, and John B. Smith, we feel justified in expressing this hope and send to all, who may receive it, this first number, greeting.

During a large part of the year the force of the Division is actively engaged in experimental work and original research, which fact will preclude the issuing of this bulletin as regularly as an ordinary monthly; but it will be our endeavor to issue it on an average once a month, and to complete a volume with each year.

C. V. RILEY,
Entomologist.

THE CORN-FEEDING SYRPHUS-FLY.

(*Mesograpta polita* Say.)

[Order DIPTERA; family SYRPHIDÆ.]

In his summary of the larval habits of the family Syrphidæ,* Dr. Williston makes the following general statement:

"The principal genera in which the larval habits are known are the following:

"*Baccha*, *Syrphus*, *Sphærophoria*, *Pipiza*, *Paragus*. Larvæ aphidophagous.

"*Mallota*, *Spilomyia*, *Xylota*, *Brachypalpus*, *Pocota*, *Myiolepta*, *Chrysotoxum*, etc. Larvæ in decaying wood or trees; some of them (*Mallota*) long, 'rat-tailed.'

"*Chilosia*. Larvæ living in stems of *Cardium*, *Sonchus*, *Scrophularia*, *Matricaria*, and in fungi (*Boletus edulis*, etc.).

"*Platychirus*, *Rhingia*, *Eristalis*, *Syritta*, *Orthoneura*. Larvæ in decaying vegetable matter, manure, or in soft mud impregnated with decaying vegetable matter.

"*Brachyopa*, *Xylota*, *Chrysochlamys*, *Ceria*. Larvæ found living in flowing sap of trees.

"*Crioprora*. Bred by Osten-Sacken, from larvæ found under oak bark.

"*Microdon*. Larvæ common in ants' nests. * * *

"*Volucella*. Larvæ are parasitic upon Humble Bees, living in their nests."

FIG. 1.—MESOGRAPTA POLITA. *a*, larva; *b*, pupa; c, adult—all enlarged (original.)

* Synopsis of the N. A. Syrphidæ (Bull. 31, U. S. National Museum), Washington, 1886, pp. 270–272.

It will be seen from this résumé of the known larval habits that the habits of the species which we are about to treat are quite abnormal in its family so far as known. Moreover, in its tribe, *Syrphini*, it is still more anomalous for the reason that the only two genera of this tribe of which the larval habits seem to be known, viz, *Syrphus* and *Sphærophoria*, are carnivorous, feeding upon Plant-lice.

Mesograpta polita, then, as a plant-feeding species is worthy of record as of more or less abnormal habit, as well as on account of its possible effect upon the productive qualities of corn.

In August, 1885, Mr. E. C. Taggart, of Griggstown, Somerset County, N. J., sent to the Department some pieces of fodder corn taken from a field on his place, and which were covered with small yellowish maggots. His corn had not appeared to suffer from their presence and he was at a loss to know to what to attribute their presence. A microscopic examination of the living larvæ showed at once that the alimentary canal of each was full of partly-crushed pollen grains, and upon placing the fresh male blossoms of corn in the breeding jar the larvæ clustered upon them and were observed feeding upon the pollen grains.

Subsequent correspondence with Mr. Taggart showed that the maggots were noticed during that season for the first time, and when first observed (the third week in August) appeared to be confined to a single patch of fodder corn, occurring so abundantly as to cover the leaves and congregating most in the axils, where the upper leaves join the stalk. This patch of corn was cut August 22, and thirteen days later when it was partially cured, the worms were observed still living and increased somewhat in size. A patch of fodder corn, distant about one hundred rods from that on which they were first observed, was planted later, and did not blossom until the first week in September. The worms were then found to appear on this patch also, and again the "stalks became literally covered by them." Strange to say they occurred only in these two patches on Mr. Taggart's place; other fields examined by him were entirely free from the worms.

From specimens received from Mr. Taggart August 31 the adult flies were bred September 7 to 15, the larvæ having become coarctate a day or so after arrival. These flies were determined by Dr. Williston as Say's *Mesograpta polita*, a species which has a wide range throughout the United States east of the Mississippi, and which is also found in Cuba. It is about 8^{mm} long, and has a wing expansion of 14^{mm}, and is yellowish in color, marked with brown.

The damage which will be done by this insect in this way is not likely to be great. Should they increase enormously and spread to other varieties of cultivated corn they may reduce the yield considerably by preventing the fertilization of the female flowers and the "make" of the ears.

That this species is not confined to pollen for its larval food, but that it feeds also upon the leaves, and apparently exclusively upon the leaves in Florida, was discovered nearly a year later by one of our agents, Mr. Ashmead, who describes his observations as follows:

"On May the 30th many of the puparia were found attached to the upper surface of the leaves of corn and, near the base of the leaf stalk, in Col. L. W. Spratt's garden near Jacksonville. During that night and days subsequently, flies hatched out in my breeding boxes, and also some parasites.

"On June 1, after a thorough search, I found the larvæ in quantities, some feeding on the corn at the base of the corn-leaf stalk, others in soft discolored places in the stalk.

"Cutting into these discolored soft places then and days afterwards, with my knife, I discovered and obtained the larvæ, some fully grown, others not half grown, and watched them feed. They would elongate the front segments as is usual with Syrphid larvæ feeding on Plant-lice, protrude and puncture the saccharine cells of the corn, and suck up the exuding juice; the operation could be plainly seen through the translucent body walls of the larvæ.

"Parts of the stalk with these larvæ were taken home and placed in tin cans, to keep the stalk moist and prevent it from drying up; as the maggots matured they came forth, attached themselves to the stalk or to the sides of the tin can, and transformed to puparia, from which flies were afterwards obtained.

"The whole transformation from egg to fly is completed within a comparatively short period of less than three weeks. The egg hatches in from three to four days; the larva matures in from eight to ten days, and the fly appears in from eight to thirteen days.

"*Its injuries.*—While the larvæ must undoubtedly affect maturing corn, yet the injury they do can not be great; no appreciable injury was observed, and unless they increase and become much more abundant than they are at present no serious damage may be apprehended from their attacks by the grower."

On the receipt of this information from Mr. Ashmead, we wrote him of the New Jersey observations and directed him to verify his observations most carefully, noticing particularly whether the larvæ did not feed upon the pollen instead of, or as well as, the leaf and stalk. On receipt of these instructions he states that he went carefully over every field of corn, examining the tassels for larvæ, but could not find a single individual feeding upon pollen. The flies were found upon the plants in abundance and were observed to feed upon the pollen.

Mr. Ashmead reared from the pupæ of this insect three distinct parasites, which will be described in a future number.

The descriptions of the Syrphus fly which immediately follow will sufficiently enable its recognition in all stages. The early stages have never before been described.

MESOGRAPTA POLITA, Say.

Egg.—The egg, according to Mr. Ashmead, is pure white, elongate-oval, with longitudinal and intersecting cross-lines or grooves, not apparent to the naked eye. It measures nearly 1^{mm} in length.

Larva.—Average length about 7^{mm}. Slender, subcylindrical, tapering anteriorly, its posterior end slightly flattened. The whole body is divided by apparently 36 annulæ, and its surface is closely granulated. Mandibles black. The last segment bears the two short, stout, polished, dark-yellow spiracular tubes, each with 3 spiracles at the tip. Color pale yellowish, or more or less of the color of the pollen, with 2 medio-dorsal, slender, somewhat wavy purple lines, which start conjointly on the first segment, diverging but slightly posteriorly, and terminating on the anterior portion of the penultimate segment, which latter is marked in addition with 4 somewhat reddish and squarish spots, arranged in transverse square.

Puparium.—Length 5^{mm} to 7^{mm}. Clavate subcylindrical, slightly curved, its anterior end thickest and rounded. The posterior end has a median carina and rather sharp lateral edges and more or less flattened ventral side. The last segment bears the two spiracular tubes with black spiracles, the upper one of which is smallest and round, whilst the two other larger ones, which are placed close above each other, are transversely oval.

Color greenish or brownish yellow, marked often with a more or less distinct dusky median, an interrupted subdorsal, and a lateral line. The median line is generally present only along the posterior carina.

Imago.—Average expanse 14^{mm}, average length 8^{mm}. Eyes brown. Face of male entirely yellow; of female, with a broad, somewhat dusky stripe above antennæ. Face of both sexes in a certain light beautifully pearlaceous. The upper posterior margin of the head yellow, with yellow hairs. Cheeks whitish, with silvery hairs. Antennæ more or less dark orange, with their upper edge in the female somewhat dusky; bristle black. Thorax dusky, often with a brownish tinge and grayish median line. Scutellum and halteres, bright yellow. Metathorax, black. Sternum, blackish, with pearlaceous reflections. Legs and a large lateral spot below wings yellow. Abdomen banded with yellow and black, and with a pair of large, somewhat oval yellow spots on segments 3 and 4. Wings clear, iridescent, without spots or other markings.

THE WILLOW-SHOOT SAW-FLY.

(*Phyllœcus integer* Norton.)

BY C. V. RILEY.

[Order HYMENOPTERA: Family UROCERIDÆ.]

NATURAL HISTORY.

For several years past this species has been known to damage the young shoots of the different species of Willow and occasionally also those of *Populus nigra*, or Italian Poplar, on the Agricultural Grounds at Washington, but as the damage done was of no serious consequence it attracted only casual attention. Lately, however, its ravages have become of a serious nature with those engaged in the cultivation of willows for market purposes, and particularly on the plantation of Admiral Ammen, at Ammendale Md.; but the author of the mishief escaped notice and its work was attributed to *Cimbex americana* till in June, 1886, steps were taken to investigate the habits of *Cimbex americana*

and if possible to detect the real author. Till then the mischief had been attributed to this species,* but, notwithstanding that the field was literally swarming with this large saw-fly, not one was seen to puncture any of the willows. All the willows except very few along the edge of the field, which appeared to have been very recently injured, appeared to be in healthy condition. The affected shoots, the tips of which were hanging down, had become brown and almost dry from the fierce heat of the day, and showed, when closely examined, unmistakable evidence of the work of this *Phyllœcus*, whose life-habits, with the assistance of Mr. Pergande, we have been able to trace.

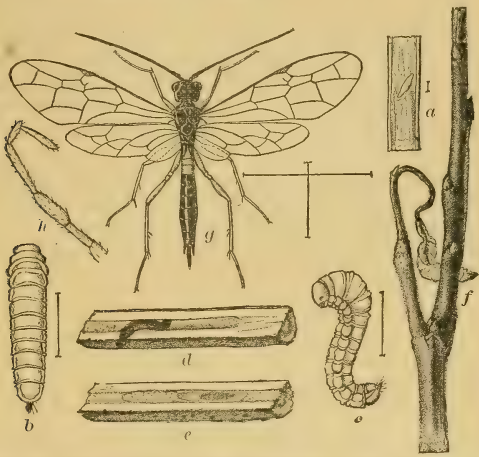

FIG. 2.—PHYLLŒCUS INTEGER. *a*, egg; *b*, larva, dorsal view; *c*, same, side view; *d*, *e*, two views of burrow; *f*, twig, showing damage; *g*, adult; all enlarged except *f*; *h*, antenna, still more enlarged (original).

Admiral Ammen stated that the year before almost the whole field looked like these shoots, appearing as if it had suffered from a severe frost or as if a fire had run over it, and that by autumn large numbers of the shoots had been killed close to the ground.

As the larva of this insect, which resembles very much that of *Urocerus* or *Tremex*, is a true borer, the female inserts her eggs in the stems of willows or nearly related plants and by a wonderful instinct girdles the twig after she has consigned her egg, to prevent it from growing any further, and in order to protect the egg from being crushed. The eggs are inserted in an oblique direction into the pith of the stem, from 2 to 6 inches below the tip, and the girdle is made about 1 inch above it.

The puncturing of the tip is evidently done with the ovipositor, as the punctures can be traced into the pith. The tips soon become dry and

* See Report Entomologist, Ann. Rept. Dept. Agr., 1884, p. 334.

brown and gradually drop off, so that by the end of the year very few remain in position. How long the eggs remain unhatched has not yet been observed; it is probably not more than about a week. The earliest date observed of the appearance of the flies from shoots which had remained out-doors all winter was April 16, while others continued to issue until the early part of June. The young larvæ appear to grow very slowly, and gradually bore their way down through the pith often to a distance of often more than 2 feet, completely filling the channel behind them as they progress with their frass. At the commencement of November most of the lavæ are full grown, and proceed to fill closely with frass the lower end of the burrow for about one-quarter or one-half inch. They then eat a passage through the side of the shoot and about one-quarter inch above the prospective cocoon, without, however, cutting through the bark. After this the delicate, transparent, cylindrical cocoon is spun, in which the larva remains through the whole winter. About the 1st of March it changes to pupa, in which state it remains for about a month and a half.

This is so far the only species among the *Cephides* found in America of which the history is known, although in Europe several species belonging to different genera have been found to infest stems, branches, or leaf-buds of different plants, and one species (*Cephus pygmæus*) is quite injurious to growing wheat, boring in the stalks in a similar manner.

REMEDIES.

A very simple remedy consists in pruning the tips of the shoots as soon as they commence to wilt. The tips should be cut off about 2 or 3 inches below the point where the punctures girdle the stem. The severed tips may be allowed to remain on the ground, as the eggs or larvæ will not develop in them, and whatever parasites the species may have will then probably mature.

DESCRIPTIVE.

PHYLLŒCUS INTEGER, Norton.

There are some differences between the specimens reared here and Norton's description of *integer*, but we feel disinclined to give them specific weight. According to Cresson's catalogue this species is placed in the genus *Cephus*, but from the few characters given in his synopsis we are not able to place it in this genus, and it is excluded from the only alternate, *Janus*, by characters given by Norton. We are therefore obliged to retain it in *Phyllœcus*.

EGG.—Length almost 1^{mm}, white, polished, elongate, oval, and slightly curved. Stouter at one end and more pointed at the other.

LARVA.—Average length when full grown about 10^{mm}. Diameter almost 3^{mm}. Color yellowish. Head polished, indistinctly reticulated, with four shallow foveæ on the clypeus and a deeper one each side. Labrum large, conical, its tip rounded. Antennæ 6-jointed, extremely small, the 3 basal joints much the stoutest; rather close to the very small eyes. Mandibles large, broad, with 3 brown teeth. Thorax much swollen, especially its two posterior segments. Legs rudimentary, having a stout

conical basal piece, and a minute cylindrical, nipple-like apex. Cremaster brown, somewhat flattened, its base conical, yellow, and beset with brown teeth; its tip obliquely truncate, with a central puncture. The surface of the abdomen is covered with very minute sharp points, and its lateral margin is prominent, broad, and flat, and resembles on each segment a flat scale. The position of the larva in its burrow is in the shape of an S.

COCOON.—Length 10-13^{mm}. Colorless and transparent. Cylindrical, rounded at both ends, filling completely the diameter of the channel, and situated near its base.

IMAGO.—*Male, female.*—General color black and highly polished. Head large, with sparse and very fine punctures on vertex. Clypeus sparsely pilose. Eyes brown. Mandibles white, with the three teeth, of which the median one is much the smallest, brown. Palpi pale yellowish, the two last joints somewhat brownish. Prothorax highly polished, rarely with any punctures, its posterior margin, tegulæ, base of wings, a spot each side on mesothorax, posterior to base of wings, tip of scutellum, and a small median spot on the metathorax yellowish white. Mesothorax closely punctured; punctures on scutellum somewhat coarser and not so dense; its disk and lower portion of the sides often without punctures. Sternum profusely punctured and covered with short grayish hair. Legs rufous, base of anterior and median coxæ and last joint of their tarsi, apical two-thirds of posterior tibiæ and their tarsi black. Base of posterior tibiæ yellowish. Claws bifid, reddish, with black tips.

Abdomen black, with either one, two, or three of the basal segments rufous in the female; the abdomen of the male is entirely black dorsally; ventrally, however, segments 1 to 4 are more or less reddish. Wings perfectly clear, iridescent, and without any spots. Stigma and veins black. Costa yellowish-brown, darkest near stigma. The basal transverse nerve of the first marginal cell is always abbreviated near the stigma.

THE SUGAR-CANE BEETLE INJURING CORN.

(*Ligyrus rugiceps* Lec.)

By L. O. HOWARD.

This insect has been known as a sugar-cane pest in Louisiana for many years, gnawing into the stubble in early spring and feeding from the middle of March until May and June. The writer's observations upon this habit of the beetle, made in Louisiana during the spring of 1881, were published in the Annual Report of the Department for 1880, pages 236–240 and in Special Report No. 35. In 1880 much loss was occasioned by its work on the rich sugar plantations along the Bayou Teche. During this year Professor Riley received specimens from Daniel Thompson, of Pattersonville, Saint Mary's Parish, and published a short account in the American Entomologist for May of that year (Vol. III, p. 130.) He had previously received specimens from a correspondent at Baton Rouge, who reported the beetle as injurious to young corn and grasses.

In June, 1885, Professor Riley received specimens of this insect from Mr. H. M. Houston, of Monroe, Union County, N. C., who stated that it was new to himself and neighbors, and that it worked just under the surface of the ground, cutting into young corn with five or six leaves, working in as far as the heart, and killing the center blades without

killing the side blades or without cutting the plant down. He gave no particulars as to the amount of damage. (This instance is recorded in Bulletin No. 12, Division of Entomology, p. 33).

In May, 1886, the same insect was received from a new locality. Mr. G. W. Smith-Vaniz, of Canton, Miss., writing to the Division under date of May 27, says: "I herewith mail you specimens of a bug that is very destructive to growing corn, especially in wet land. The section of corn plant sent with bug within it, where he was at work when taken, shows how complete is the work of destruction. I first noticed this pest last season (1885), though of course it may have been here before. There is general complaint of damage from it this year. It continues its ravages through the growing season, causing stalks to fall even when in ear." June 27 he again wrote: "I have delayed writing, awaiting further developments. The gravid females are at this time very numerous. I find a few eggs here and there singly through the earth, near to roots of the corn where the beetles are at work. These eggs are similar to those within the beetle. They hatch out a white grub with a horny, red head. I have not yet succeeded in getting any eggs from beetles in confinement, neither as yet have any eggs dissected from the beetles hatched. There is no abatement of the work of destruction, successive plantings only furnishing a fresh supply of favorite food to the insect. This is the worst insect enemy to the corn plant we have yet had on heavy, wet land. * * * We have had an excessively wet June, 8¾ inches of rain-fall to the present time during the present month, and still raining every day. I cannot say whether this is favorable or unfavorable to the beetle."

July 9 he sent a shipment of eggs and larvæ, though most of the former were destroyed by mold. He stated that a few days of hot sunshine, though with occasional showers, had made it hard to find the beetles. In a quite extensive search he found only one beetle, and that was a dead one. There was evidence, however, that the beetles had been at work the previous night. July 19 he wrote that although up to July 9 he had had little difficulty in finding eggs, young larvæ, and perfect beetles, yet after a week of dry weather they had entirely disappeared, and he could only find an occasional large white grub (larva of *Lachnosterna fusca*). He still, however, continued to find fresh work of the beetle, evidently done at night, and judged that they sought shelter from the sun elsewhere during the day. Once or twice, however, he took a lantern into the field at night, but the beetle was not attracted, and moreover it never found its way to the lights in the neighboring houses.

Mr. Smith-Vaniz also sent us at various times the allied beetles, *Ligyrus ruginasus* Lec., and *Anomala flavipennis* Burm., found among the Corn-beetles, but not identified in any way with their work.

Although the greatest care was taken with the eggs and young larvæ received in July, we were able to do nothing with them, and they died before fall.

During 1887 we heard nothing of this insect, possibly also from the fact that the larvæ may require two years for development. During the winter, in response to inquiries concerning the facts for 1887, Mr. Smith-Vaniz wrote that he failed to rear to maturity any larvæ in 1886; that they perished when apparently half-grown. He intended to pursue the subject in 1887, but, though there were a few beetles to be found early in the season, they disappeared so unexpectedly soon that he secured none for propagation. In 1886 they were to be found around the corn-roots throughout the growing season, and mature beetles were found as late as December 1.

Thus this subject, in spite of its interest and importance, remains comparatively unsettled, because the important point as to where and how the insect hibernates is still unknown. This article will set forth the rather curious fact of the great damage which may be done to corn by this species, and presents strong additional proof on the hitherto unsettled point of the place where the eggs are deposited. There can be no reasonable doubt that the eggs and young larvæ collected at the roots by Mr. Smith–Vaniz belong to this species; but the length of larval life and the manner of hibernation must be left to another favorable opportunity to decide.

It will be observed that the testimony above quoted, on the attraction of light to the beetle, is diametrically opposed to the statements by Professor Comstock on page 239 of his report for 1879, in discussing the injuries of this species to sugar-cane, and, if true, invalidates his consequent recommendation of the use of trap lanterns in the field. The writer, however, was informed at Franklin, La., in March, 1881, that the beetles were attracted in such numbers to the light in the windows of a small grocery as to be the subject of general comment. It is to be doubted, however, whether the beetles can be attracted by light when actually engaged in feeding, or until after oviposition has taken place.

EXTRACTS FROM CORRESPONDENCE.

[In preparing these extracts from correspondence, which we hope to make a prominent feature of this publication, we do not pretend to give the answer of the Entomologist in full and verbatim, but simply a digest of the important points.]

THE GARDEN WEB-WORM (*Eurycreon rantalis*) RE-APPEARS.

The Web-worm (*Eurycreon rantalis*) has made its appearance in this section again; the moths first appeared in great numbers some three weeks ago and are present now in great numbers; the caterpillars are feeding on the pigweed, sweet-potatoes, cabbage; I have not noticed them on the corn yet. Has there been any insecticide tried that has been successful? I will try pyrethrum, sulphur, etc., to-morrow on my cabbage.—[Jacob Nixon, Kellogg, Cowley County, Kans., June 14, 1888.

REPLY.—Yours of the 14th with information as to damage by the Garden Web-worm just received. I have had no occasion to publish anything concerning this insect since the publication of the annual report for 1885, a copy of which was sent

you at the time. You will remember that in that report I concluded that the only remedy likely to give satisfaction was spraying with either London purple or Paris green. I would advise you to give either of these poisons a thorough trial, and anticipate success.—[June 18, 1888.]

AN ENEMY TO THE DATE PALM IN FLORIDA.

I inclose two bulbs of date palms that show the work of some small animal or insect that eats the bulbs and destroys the plants. We have a large nursery of date palms and they are being destroyed by the hundreds. The animal makes a hole about the size of your little finger, but persistent digging did not find him. Do you know what it is?—[C. A. Bowdman, San Carlos Hotel, Saint James, Florida, February 3, 1888.

REPLY.— * * * The holes of which you complain have probably been made by the Palmetto Weevil (*Rhynchophorus cruentatus*). This is the largest of our native species of snout-beetles, and is very common in all of the Southern States in which the palmetto grows wild. The beetle is sometimes nearly an inch in length, and its usual color is a dull black, but frequently specimens are found which are bright red or red with black spots. Although usually confined to the palmetto the beetles attack all kinds of small palms. There is no remedy known except catching the beetles and killing them. They can be caught in large numbers by cutting off a palmetto plant say 1 foot from the ground, when they will congregate in large numbers upon the stump and can be picked off from time to time. The grub or larva of this species is eaten as a delicacy in South America.—[February 7, 1888.]

A VIRGINIA SIMULIUM CALLED "CHOLERA GNAT."

Inclosed herewith please find specimens of the "Cholera Gnat," which I trust will reach you in good time and condition.

The Cholera Gnat is the local name for these insects, because they are supposed to produce or cause the chicken cholera. There is no doubt about their causing the death of thousands of chickens and turkeys in this section yearly. I moved to this place in January last and was told that it would be impossible to raise chickens or turkeys as the cholera would kill them all; notwithstanding which I bought both chickens and turkeys, determined to fight the cholera should it appear. Saw nothing of it until about the 1st of April, when my attention was attracted first by the turkeys shaking and rubbing their heads, and upon examination found the gnats upon the wattles sucking vigorously. The gobblers and roosters are the first to succumb, as their wattles and comb are larger, exposing a larger surface for the gnats to work upon. The fowl grows weak and feverish; the discharge from the bowels becomes frequent and watery, resembling sulphur and water, and in a few days the fowl dies of "chicken cholera."

I send you this specimen of these gnats hoping you can give me some information regarding them, and can suggest a remedy. If I can free my chickens from these gnats I am satisfied there would be no cholera.—[James T. Gilliam, Mossingford, Charlotte County, Va., April 12, 1888.

REPLY. * * * The insect in question, and which you call the "Cholera Gnat," seems to be identical with the insect which is known in the Mississippi Valley as the Turkey Gnat, and which I described scientifically for the first time in my report for 1886 as *Simulium meridionale*. It is closely allied to the celebrated Buffalo Gnat of the Southwest and the equally well-known Black Fly of the North Woods. I will send you with this a copy of the report in which this species is described, which contains a summary of what is known about these insects, and you will find, I fear, that on the whole it is rather unsatisfactory, especially as regards remedies. I should like to hear from you as to whether the gnats appear during the greater part of the summer or if they are confined to a particular season. If the latter is the case, what is the duration of this period? You will notice from the report that the early stages of these gnats are all passed in running water, and the illustrations will probably enable

you to recognize these early stages in swift-running streams in your neighborhood. If the period during which the flies appear should be short, and if you are able to keep the fowls in a dark house during this period, you will probably find it advantageous to do so. The best applications to be made are indicated in the report, and will probably prove to be fish oil or something similar. Persian insect powder puffed upon the fowls will kill all of the gnats which happen to be on it at the time, but will probably not act as a preventive. * * *.—[April 16, 1888.]

THE BLACK-POLLED TITMOUSE DESTROYING CANKER WORMS.

Paleacrita vernata, or Spring Canker-worm, seems to be troubling our orchards hereabouts for the first time. I notice the birds and chickens are destroying a host of them. If London purple does not kill both, all will be well. One little bird, the black-polled chickadee or titmouse (*Parus atricapillus*), is hungry for them.—[W. S. Newlo[illegible] Oswego, Kans., April 23, 1888.

KEROSENE EMULSION AND THE CABBAGE MAGGOT.

Your kerosene emulsion has done wonders on *Anthomyia brassicæ*. We have used on our cabbage, that was badly infested with cabbage fly, and now, upon examinatio[illegible] they are entirely gone and the plants not hurt the least, but your formula is t[illegible] strong; 9 gallons of water to 1 of kerosene has killed all the plants we put it o[illegible] after that we mixed it 12 gallons of water to 1 gallon of emulsion, and this has do[illegible] no harm to the plants, but has destroyed all the worms.—[Zimmer Bros., Mobile, Ala.

AFTER EFFECT OF THE OVIPOSITION OF THE PERIODICAL CICADA.

* * * Five or six years ago the so-called 13-year locusts did great damage to our orchards. I send a cut from a twig which shows their work. The wounds are on the underside of every branch less than an inch in diameter. Trees in such plight can not give crisp and juicy fruit. The apples are small, wilted, and tough, and let go their hold on the tree with a slight breeze. My row of Rome Beauties fruited heavily the past two years. At harvesting time not more than a dozen remained on the trees. It was the same with other varieties.

As far as my observation extends other orchards are like mine geatly damaged by the locusts.

This is not a flattering statement, but I thought it right to give facts, and hope to be able to give a more favorable account in future.—[A. G. Alexander, Queen City, Mo., February 13, 1888.

[See fig. 3, plate V, Rept. Ent., Ann. Rept. Dept. Agr. 1885, for illustration of appearance of scars from puncture of Periodical Cicada after second year.]

MORE TESTIMONY ON THE BUCKWHEAT REMEDY FOR CUT-WORMS.

Have you ever noticed the effect of plowing under a crop of buckwheat to keep cut-worms off the land? It has been our experience the last fifteen years that wherever we turn under a crop of buckwheat we will not have any cut-worms on it; but this year has been the most remarkable of all. The seed we got from the North was of a very poor quality, hardly coming up at all. So we sowed the remaining seed, about two bushels, on a piece of about one-half acre. This gave us a good stand. Now everywhere cut-worms are plenty, except on the little piece where the buckwheat has been turned under. We always have been free from cut-worms on land we have plowed buckwheat under, while our neighbors have sometimes their whole crop ruined by them.—[Zimmer Bros., Mobile, Ala., February 6, 1888.

AN APPLICATION FOR BUFFALO GNAT BITES.

In looking over your report for 1886 I do not see a preventive for buffalo gnats that I used successfully during the war. In the absence of fish oil, which had been used previously, I used tallow, with sufficient pine tar to make it stick the hair together, but not enough to take the hair off, as I was told it would. Lost none of about 90 mules and horses.—[Jona Pearce, Gwiney's, Va.

COMPARATIVE MERITS OF THE ARSENICAL SOLUTIONS.

We are vitally interested in the best methods of fighting the Codling Moth. We expect a big crop of apples next year, and we are investigating the spraying with the arsenical solutions. I don't see why, from a chemical standpoint, the reason for using Paris green or London purple, as both are hard to make a perfect solution, and it must be the arsenic which does the good. Why not use the common white arsenic? It is easily dissolved, and with concentrated lye will make a perfect and stable solution, and is cheap. From all that I can learn from California and the East a weak solution, used frequently, is better than a strong solution, as the stronger solutions burn the foliage. I will try one-half pound arsenic, 1 pound concentrated lye, to 400 gallons water, and will spray the latter part of May, June, and July. * * *.—[A. Goslin, Oregon, Mo., December 26, 1887. Addressed to Prof. S. A. Forbes.

Reply.—Your letter of the 26th of December, addressed to Prof. S. A. Forbes, has just been referred by him to this office for reply. White arsenic has been used against the Codling Moth by several experimentors, with a fair measure of success. J. N. Dixon, of Oscaloosa, Iowa, was the first to use it for this purpose, and he was enthusiastically in favor of it. In his essay on orchards and insects published in the Transactions of the Iowa State Horticultural Society for the year 1882, he advises a much stronger solution than the one which you propose to try. Less than 1 pound of arsenic to 150 gallons of water, he states, will burn the foliage, and he himself was accustomed to use 1 pound to 200 gallons of water. He first dissolved the arsenic by boiling in a smaller quantity of water, afterwards diluting to the required strength. The tests of later experimenters give the preference to London purple and Paris green, for the reason that they seem to take less effect upon the foliage than the arsenic alone. In other words, when the solution of white arsenic is strong enough to kill the insects in one or two applications it is very likely to burn the foliage. This is not an absolute statement, but a comparative one. Cook, of Michigan, prefers London purple; Forbes, of Illinois, and Wickson and Klee, of California, give the preference to Paris green. I myself am inclined to the opinion that London purple, on the grounds of effectiveness and cheapness, as well as from the fact that trees which have been treated can be readily distinguished by color, is perhaps the best substance which can be used; although its advantages over Paris green are slight. It should never be used in a solution stronger than 1 pound to 100 gallons, and it should be applied as soon as the blossoms fall.

If, however, you are still inclined to experiment with the arsenic and concentrated lye, I shall be very glad to learn your results, and such an experiment as you propose will certainly be instructive.—[February 16, 1888.]

PROBABLY A NEW ENEMY TO PEAR FROM OREGON.

Inclosed find affected pears and leaves, also an insect which I detected eating the foliage of my young pear trees. I saw none on the bearing trees, but as nearly all the fruit is affected on them (three trees left of an old orchard) the inference would be that they had left the fruit to attack the foliage on the young trees just set out. I have just set out an orchard of 150 acres, and want to head off all destructive insects. What is this insect and what the remedy?—[R. S. Wallace, Salem, Oregon, May 12, 1888.

Reply.—I have read your letter of May 12, and examined the accompanying specimens with considerable interest, for the reason that this insect has never been known before to do such damage as you describe. It has no common name, but is a snout-beetle, known as *Aragnomus griseus*. May I inquire whether you are absolutely certain that this is the insect which did the damage, and whether you are sure that it injured the fruit? Nothing is known of its breeding habits, and the only thing that we can do is to recommend a remedy for the adult insect. To this end I would advise you to spray your young trees with a solution of Paris green or London purple in the proportion of 1 pound of the poison to 100 gallons of water * * * .—[May 22, 1888.

AN EXTRAORDINARY TWILIGHT FLIGHT OF LACHNOSTERNA.

* * * Inclosed please find specimens of bugs which passed over from north to south in wonderful swarms or droves the evening of the 7th, about one to every 18 inches square, as low as 5 feet from the ground to 12 to 15 feet high. When I first heard them I thought it was a swarm of bees, but soon saw my mistake. When I first heard and saw them the sun was just hid from sight, and they continued to fly until quite dark. As far as I have heard the swarm or drove was 1½ miles wide. Where they came from or whither they went I do not know, but it was new to me, both insect and their great number. I send them to you to know if they are common and their origin.—[S. H. Linton, Burrows, Ind., May 9, 1887.

REPLY. * * * The beetle proves to be *Lachnosterna tristis*, a near relative to the common May beetle, which, as you doubtless know, is the parent of the White Grub. This particular species is one of the smallest of the genus and is not at all uncommon. It is frequently turned up in plowing, as it hibernates in the beetle state under ground. The larva is much like the White Grub, through smaller, and probably feeds upon the roots of various plants in the soil. The swarming which you describe is very interesting. These beetles often occur in great numbers, but so far as I am aware they have not been observed to fly in such swarms before dark. They probably bred in the near neighborhood of the locality where they were observed, and as they feed on leaves of different trees soon after dark, they were probably in search of proper food.—[February 15, 1888.]

LIME AND TOBACCO FOR CURRANT WORM.

Results of experiments are requested by the very inception of your Department. I will relate a success. Last summer I went out into the garden one morning and found the currant worm (*Nematus ventricosus*) had attacked one side of a currant bush and one side of a gooseberry bush. I sprinkled the parts of both on which the worms were at work, and then dusted on a compound of 2 parts of unslacked lime and one part of tobacco dust, from a cigar factory, which killed every worm and stopped the injury. One application was sufficient.—[V. M. Firor, Charlestown, W. Va.

SOME NOTES FROM MISSISSIPPI.

I have the honor to submit a report on insects most injurious to field and garden crops for the past year, 1887.

(1) The Cottonworm (*Aletia xylina*) appeared in some portions of our county in July, in others in August, and in my own vicinity about the middle of September. The damage done by them averages from 10 to 40 per cent. of the entire crop. I have found one of the worms closely wrapped up in dead Sweet Gum leaves in the fence corners of my field as late as January the 8th, 1888, but in a very stupid condition. (2) Bollworm (*Heliothis armigera*) did but very little damage here on corn as well as cotton. (3) White Ants or "Wood Lice" (*Termes flavipes* K.). Have found these insects destroying a good many cotton-stalks during the past summer, attacking the stalk just below the soil, eating out the interior, which would kill the plant at every instance. (4) Southern Cabbage-butterfly (*Pieris protodice* B.). The cabbage crop was seriously damaged by the worm of this fly. (5) Cabbage Plusia (*Plusia brassicae* R.). This worm likewise did a great deal of damage in the gardens of this community. (6) The Greasy Cut-worm (*Agrotis ypsilon*, Rott.). This worm has been more plentiful this past season and destroyed the stand of cabbage plants as fast as transplanted. (7) Glassy Cut-worm (*Hadena devastatrix* B.). Found several specimens of this variety in my garden cutting down cabbage, beet, and radish plants. (8) Squash Borer (*Ægeria cucurbitae* Harris). This insect has been a formidable enemy to squash, pumpkin, cashaw, and cucumber, killing them in many instances in field and garden.—[G. H. Kent, Roxie, Miss., January 28, 1888.

NEW SPECIES OF ONCOCNEMIS.

By John B. Smith.

In continuation of the work on the Monograph of the Noctuidæ by Professor Riley and myself, the following new species are found to occur in the genus *Oncocnemis:*

O. fasciatus, sp. nov.

Head, thorax, and primaries dull fuscous gray. Primaries with basal line single, distinct, black. Basal space to t. a. line paler, more ashen gray. T. a. line rather broad, single, black, outwardly oblique, making two large and not very prominent outward curves. T. p. line single, marked at costa, making a strong outward curve over reniform, then strongly incurved, interrupted by the white transverse band, again distinct below the reniform, and with a slight inward curve to inner margin. Claviform wanting. Orbicular rather small, round, narrowly outlined in black, somewhat paler than ground color. Reniform large, not very well defined, white, with a narrow fuscous crescent. Between reniform and t. p. line the ground color obtains and gives a deceptive appearance of the reniform in the broad white band. A narrow shade band crosses the outer part of the median space, distinct and blackish on costa, less marked below. A broad, white, transverse shade, over and including the reniform, leaving a fuscous patch beyond that spot, inwardly limited by the t. p. line, and almost extending to the s. t. line. S. t. line marked only by a series of sagittate black dashes, shading off into the white band. Terminal space of ground color. A narrow, terminal, dark line. Fringes concolorous, fuscous, narrowly cut with darker brown. A whitish line at base. Secondaries dull smoky brown at base, outwardly limited by a black transverse band. Beyond this a broad white central band, the outer margin again broadly black. Fringes white, basally fuscous. Beneath, both pairs of wings fuscous gray at base, outwardly limited by a black band; this is followed by a broad white band, the margins again broadly black. Head and thorax concolorous with basal space of primaries, abdomen a trifle paler.

Expands 1.1 inch 27.5^{mm}.

Habitat, Nevada County, California. (Sept.)

A single ♀ in the Coll. U. S. N. Mus. (from Dept. Agric., Koebele, collector).

The species is strongly marked and unlike any heretofore described. The common white transverse band is characteristic and renders the species easily recognizable. Its general appearance seems to refer it most nearly to the yellow underwinged group.

O. tenuifascia sp. nov.

Head, thorax, and primaries dull fuscous brown, the ordinary maculation of primaries distinct, though not prominent, blackish. Basal line present, black, with a narrow, following pale line. T. a. line distinct, oblique sinuate, black, preceded by an equally distinct pale line. Practically the line is geminate, the inner portion reduced to a few dark scales defining the intermediate pale shade. T. p. line distinct, geminate, inner line black, distinct, outer line punctiform, the intervening space white, the white line becoming broader toward the inner margin. As a whole, the line curves outwardly over the reniform, and nearly straight below vein 2. Claviform distinct, black margined, concolorous. Orbicular small, round, black ringed, with an inner white annulus. Between the ordinary spots the cell is blackish, and from this point the narrow median shade runs parallel with and close to T. p. line to the hind margin. Reniform rather small, narrow, normal in shape, not very distinctly outlined, first black margined, then with a paler annulus, the center of ground color of wing. S. t. line irregularly, but not strongly dentate, narrow, whitish, in-

terrupted, preceded by a series of small black spots. A few white scales in S. t. space opposite cell, and a rather large indefinite pale spot filling the space near hind margin, a row of black terminal lunules. Fringes dusky, cut with darker fuscous and with a fuscous line at base. Secondaries smoky at base, limited by a sinuate black band, then a narrow white band, followed by the broad, black outer margin. Fringes white. Beneath, both pairs of wings smoky at base, with a common black median band, followed by a broader white band, the outer margin broadly black.

Expands .88 inches—22mm.

Habitat Colorado.

A single female in Mr. Tepper's collection. The species is an easily recognized one. Its small size and the banded secondaries are unusual. The primaries are somewhat broader and shorter than usual, and the body somewhat less robust. The eyes are not very distinctly lashed.

Despite its somewhat abnormal appearance I believe the species correctly referred here.

O. IRICOLOR sp. nov.

Head, thorax, and primaries somewhat pale luteous, the primaries more or less powdered with bluish-black atoms which have an iridescent metallic glitter. Basal line present, black, followed by a narrow pale line. T. a. line geminate, outer line black, inner line more or less punctiform, the included space pale. As a whole, the line is somewhat irregular, very slightly curved outwardly. At the inner margin the line is preceded by a large patch of metallic dark scales, which in one specimen crosses the entire wing and in the other is limited to the inferior third. Claviform small, pale, not defined. Orbicular rather small, round, a little irregular, pale ringed, center concolorous. Reniform moderate, upright, somewhat constricted medially, pale ringed. A somewhat fuscous median shade darkens the cell between the ordinary spots, and continues as a narrower dark shade, parallel with and close to the t. p. line. T. p. line narrow, black, crenulate, interrupted, widely curved over the cell, and then with a regular inward curve to the hind margin. The narrow black line is followed by a broader, more even pale line, from which point the s. t. space darkens and becomes metallic black to the irregular, pale, and somewhat interrupted s. t. line. A row of terminal, dusky lunules, inwardly margined by pale scales. Fringes unusually long and pure white. Secondaries faintly yellowish, glistening, with a broad, black border and a distinct discal lunule. Fringes also pure white. Beneath the wings are very pale whitish yellow, with broad, blackish outer margins, the discal spot of scondaries more distinct. Head with a few reddish scales between the antennæ. Abdomen like wings beneath. Expands 1.25 inches = 31–32mm.

Habitat, Colorado.

Three specimens, all females, 1 Coll. U. S. National Museum (Smith Coll.), the others Coll. F. Tepper.

This is perhaps the most beautiful species of the genus, the metallic dark scales and the very long white fringes offering distinctive characters. The specimens differ considerably in the amount of metallic irroration; one so covered as to darken the entire specimen, another specimen with the dark markings only metallic. The species is most nearly allied to *augustus*, Harvey.

O. TERMINALIS sp. nov.

Head, thorax, and primaries dull fusco-luteous, primaries with a broad, blackish terminal shade. Basal line of primaries faintly indicated by a few black scales. T. a. line geminate, marked on costa by distinct black spots, then becoming very faint, traceable principally by the paler inclosed space, and again becoming distinct below

the internal vein, feebly dentate in its course, a blackish blotch preceding the line on internal margin. Orbicular small, round, pale ringed, center concolorous. Reniform moderate in size, normal in shape, pale ringed, with a dusky lunule inwardly, else concolorous. Between these spots the median shade is marked by a black costal spot, thence continued as a narrow sinuate, faint dusky line to the hind margin. T. p. line geminate, distinctly marked on costa, thence interrupted, punctiform, marked by black or brown venular dots, outwardly curved over cell. S. t. line narrow, pale, interrupted, irregularly dentate. From the internal margin beyond the t. p. line an oblique, blackish terminal shade extends to the apex, somewhat narrowing above the middle. Through this dark shade the s. t. line is picked out by pale scales. A row of black terminal lunules, preceded by pale defining scales. Fringes very long, with a central darker line, beyond which they are cut with blackish. Secondaries glistening white, somewhat smoky basally, and with a very broad, black outer margin. Fringes white. Beneath wings whitish, with a broad, black terminal margin. Primaries with a whitish terminal line. Fringes white, on primaries narrowly cut with brown, becoming black at tip. Head with a brown frontal line and a brown interantennal tuft. Collar black tipped, and behind it the thorax is powdered with black scales; abdomen very pale luteous.

Expands 1.25 inches—31^{mm}.

Habitat, Colorado.

A single female in Mr. Tepper's collection. A very distinct species. The collar is evidently produced medially, and there is a distinct basal tuft. The dark terminal space is characteristic.

O SIMPLEX, sp. nov.

Head, thorax, and primaries powdery fuscous, the maculation distinct. Basal line distinctly traceable, geminate. T. a. line upright or slightly incurved, strongly dentate, geminate, the outer line black, the inner line fuscous brown, included space somewhat paler. A narrow black line from base to t. a. line. T. p. line faintly geminate, inner line only distinct, black, slightly lunate, exserted over reniform, and somewhat incurved below. Claviform very long, almost crossing median space, black margined, with a pale inner line and a concolorous center. Orbicular longitudinally oval, paler ringed, concolorous. Reniform moderate in size, pale ringed, with narrow black margin, the center somewhat paler. A faintly marked shade between the ordinary spots, less marked below median vein. S. t. line pale, interrupted, irregularly sinuate and dentate, preceded by a series of long sagittate interspaceal black dashes. A row of black terminal lunules. S. t. space pale at t. p. line, rapidly darkening to the s. t. line. The veins are paler through the darker parts of the wing, and black marked beyond. Secondaries white, semi-transparent, with distinct black outer border. Fringes white. Beneath whitish, with smoky-black outer border. Head with an interantennal blackish line followed by a pale line. Collar with a black line inferiorly, black tipped, and a whitish line below the black tip. Thorax also sprinkled with black scales.

Expands 1.46 inches—36^{mm}.

Habitat, Ashley Valley, Utah.

A single, somewhat rubbed specimen, without fringes to primaries, in Mr. Edwards' collection.

This species is closely allied to *levis*, and intermediate between that and *augustus*. From the former it differs at once by the longitudinally ovate orbicular. The ground color is not ochreous, and there are numerous minor differences. The chief and very strongly marked difference between the two is in the structure of the male genitalia, differences which need not be pointed out here at present.

AN AUSTRALIAN PARASITE OF ICERYA PURCHASI.

By S. W. Williston.

[The following descriptions of a new genus and a new species of Oscinidæ were drawn up at our request by Dr. Williston from specimens received from Frazer S. Crawford, of Adelaide, South Australia, who reared them from adult females of *Icerya purchasi* Maskell and from *Monophlœbus crawfordi* Maskell in that colony. The species has been artificially introduced into California and we shall soon have occasion to write about it at greater length.]

Fig. 3. Lestophonus iceryæ. *a*, antenna enlarged (original.)

Lestophonus,* gen. nov.

Front broad, plane, with scarcely distinguishable hairs in upper part. Antennæ large, the first two joints short, the third two or three times as long as broad, reaching quite to the oral margin; arista wanting. Face flattened or gently concave; thorax without bristles; scutellum large, about half as long as the thorax, convex. Abdomen short ovate, rather broad, composed of five segments, thinly and briefly hairy. Legs rather short and strong; middle tibiæ with a minute or indistinct spur at the top; all the tibiæ without erect bristles on the outer side before the tip. Wings short and broad; auxiliary vein wholly wanting; first longitudinal vein terminating at the basal third, the costal vein at the tip of the third longitudinal vein; second and third longitudinal veins nearly parallel, the fourth vein gently divergent; penultimate section of the fourth vein a litle shorter than the ultimate section of the fifth; second basal cell and the discal cell united; anal cell distinct, but small.

Notwithstanding the presence of the anal cell the present species must, I believe, be located with the *Oscininæ*. The absence of distinct bristles on the front, or, indeed, elsewhere on the body, will prevent its location with the *Drosophilinæ*. In all the four specimens that I have examined the arista seems entirely wanting; I can not attribute its absence to injury. This remarkable character, together with the absence of the anterior basal cross-vein, and auxiliary vein, and the very large third antennal joint will, I believe, render the genus easily recognizable. I can find the description of no genus that will apply, and I have but little or no hesitancy in describing it as new. *Mosillus*, from Europe and Africa, seems to be its nearest relative.

Lestophonus iceryæ, sp. nov.

♀, Length 1.1^{mm}. Face, front, dorsum of thorax, and scutellum deep blue, moderately shining. Antennæ black, oblong, with rounded end. Abdomen punctulate,

* Ληστης—a plunderer. Φονευς—a killer.

deep shining green, in some specimens more or less blue. Legs dark brown, or blackish brown; front tarsi more lutescent or brownish yellow. Wings grayish hyaline. the veins dark brown.

Three specimens, from Professor Riley.

THE PRIVET WEB-WORM.

(*Margarodes quadristigmalis* Gn.)

[Order LEPIDOPTERA: Family PYRALIDÆ.]

THE PRIVET.

The Privet (*Ligustrum vulgare* L.) is a very common hedge plant in Europe, of general distribution and native in Central and Southern Europe. It and the closely allied Japanese species (*Ligustrum japonicum*) were introduced into this country in the beginning of the present century, and both have become thoroughly naturalized in some of the older States. Practically the sole use of the Privet in America is as a hedge-plant, for which purpose it is preferred in many localities to the ubiquitous Osage Orange (*Maclura aurantiaca*), chiefly on account of the absence of spines and also because it thrives well in much more northern climates. In Europe, however, its close-grained, hard wood is used for turning and shoe pegs, its twigs for tanning and as a substitute for osier, and its berries for red, black, or blue colors in certain dying processes, while formerly its astringent leaves were used in medicine. A well cultivated and carefully trimmed privet hedge, with its bright green foliage, is a most beautiful sight; if inclosing an orchard, and not kept too low, it forms an excellent shelter for many insectivorous birds, which love to build their nests in such protecting places. Grown singly or in small groups it attains quite a large size, and bears bunches of dark purple berries.

It suffers in America from a sudden blight, probably the result of the attack of the fungus *Phyllosticta ligustri* Saccardo, and certain leaf-eating caterpillars occasionally feed upon its foliage. But the plant has always been considered almost insect proof in this country, although in Europe twenty or more insects feed upon its leaves, the great majority of which are lepidopterous, including one of the finest of the European Hawk Moths, the *Sphinx ligustri*.

The following statements have been prepared from notes made principally by Mr. Howard and Mr. O. Lugger:

APPEARANCE OF THE WEB-WORM.

The new web-worm was first noticed upon the plants in some extensive hedges grown in the gardens connected with the Department of Agriculture at Washington, June 20, 1886, and later it was found in other parts of the city. None of the gardeners had ever seen it before, and naturally were somewhat anxious about the matter. The hedges affected by these worms, presented a most miserable sight, almost al

the leaves of the upper half of the young shoots, from two to six inches in length, were destroyed, and only fragments of leaves or portions of their midribs had been left untouched here and there. The caterpillars, which had done all this mischief, were found hidden in delicate, white, silken webs, either between the upper leaves when still quite small, or lower down on the older leaves when about fully grown. These webs, in which the caterpillars hide themselves, become in course of time partly filled with their black excrement, looking like gun-powder, and add still more to the disfiguration of the plants. The caterpillars, when disturbed, show great activity, and wriggle excitedly out of their webs; in falling they suspend themselves by a long, silken thread. If the disturbance ceases, they gradually work their way back to their homes.

Collectors of Lepidoptera had seen this moth but twice before in Washington. One specimen had been captured many years ago; it was found flying around the gas-light. The second specimen was found, in 1882, on the Virginia side of the Potomac.

NUMBER OF BROODS.

The greatest damage was done by the first brood, or at least the effects of the injury were more apparent. The second brood, living upon the same shoots, already so much disfigured, were hardly perceived, since they added but very little to the general effect. No caterpillars were observed out doors during the month of August; they were to some extent kept in check by parasites. The electric light has also been of immense value in destroying this pest. Thousands of the moths were attracted to it and never found their way back to the plants to deposit their eggs for other broods. But in captivity the result was very different, and indicated beyond any doubt the possibility of a very great danger to these privet hedges, if the insect should once have full sway to breed unmolested. Not less than four broods of moths were raised in the course of the summer, the last brood laying eggs, which, perhaps, not being fertilized, did not hatch. Moths of the different broods appeared July 2, August 5, September 6, and October 11.

LIFE HISTORY.

The Egg.—The scale-like eggs are very soft, light-green, sculptured, and measure 0.6^{mm} in length and 0.4 in width. They are usually fastened to the leaf near its mid-rib, either upon the upper or the lower surface. Being so very small, and of a similar color to that of the leaf, they are very difficult to detect. And this is still more the case in breeding-cages, where the restless moths scatter their very loosely attached, silvery-white scales so profusely over the somewhat adhesive surface of the leaf, that it soon becomes densely covered with them, thus adding to the difficulty of finding the eggs. From three males and two females imprisoned 65 eggs were obtained, yet no doubt more had been deposited but not found. These eggs in the course of a few days darkened somewhat and plainly showed the embryo. They hatched on the fifth day after being deposited.

The Larva.—In color the caterpillar of this Pyralid varies greatly, but it is usually of a lighter or darker green; the darkest specimens are almost bluish-green, the palest yellowish-green. In the great majority of cases the piliferous warts are black and polished, but in others, and chiefly in the smaller ones, they are of the same color as the body. In fact, hardly any two caterpillars, coming from the same moth, are exactly alike. The arrangement of these warts is best observed in the darker specimens, where two rows of them, each consisting of two warts, form an almost exact square upon each abdominal segment. The warts below and above the spiracles are longitudinally oval and rather far removed from the dorsal rows. The cervical plate is either black with greenish or green with blackish markings. The yellowish-green head is distinguished by two ill-defined, oblique and dusky stripes, which diverge posteriorly. The very small spiracles are dull yellow. In a number of very dark green specimens the head is more yellow than green and not marked with any black. Quite a number of these caterpillars are almost olive-green, suffused more or less with cherry-red. The recently hatched caterpillars are white, with a pale yellow head. These highly polished caterpillars reach a length of 20^{mm} when they cease to feed and prepare to pupate. The duration of their larval existence is about three weeks.

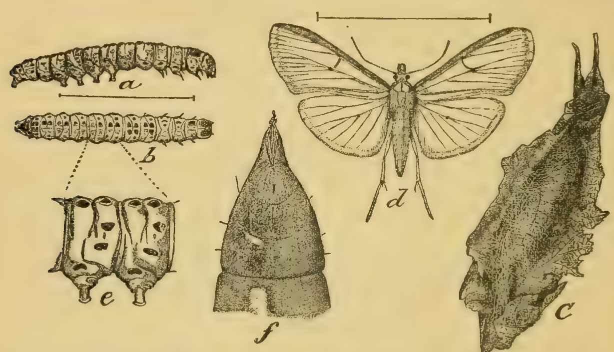

FIG. 4. MARGARODES QUADRISTIGMALIS. *a*, larva, side view; *b*, same, dorsal view; *c*, cocoon; *d*, moth—all slightly enlarged; *e*, two segments of larva from side showing arrangement of spots; *f*, anal segment of pupa from below—still more enlarged (original).

Pupa and Cocoon.—The slender, bright amber-colored pupa is 15^{mm} long, and is well protected by a double cocoon, which is, however, so thin and transparent that the pupa can clearly be discerned inside of it. The white and delicate outer cocoon, usually fastened securely between leaves or to the rubbish under the hedge, is somewhat oval, though frequently very irregular in shape; it is frequently a little denser near the anterior end. The inner and still thinner cocoon surrounds the pupa quite closely, and is connected with the outer one by a number of irregular threads. As the moth matures inside the pupa the former bright

color gives place to a dark brown, and soon after, or in about eight days after commencing to spin the cocoon, the winged insect appears.

The Moth.—The species of Margarodes are quite numerous, and all are confined to warmer regions. From a list of specimens in the collection of the British Museum, published in 1859, it is seen that 39 species had been described up to that year. One species is found in Southern Europe, one in North America, three in the West Indies, ten in South America, seven in Africa, eleven in Southern Asia, five in Australia, and one in the Sandwich Islands. The European species is very similar to the one under consideration, and has been confounded with it by Duponchel. *Margarodes quadristigmalis* Gn., described vaguely as occurring in North America, is found also in the island of St. Domingo.

All the species of this genus are characterized by white or greenish hyaline wings with more or less opaque margins. The males possess a hidden tuft of long hairs at the tip of the abdomen, which they can spread out like a fan if excited.

The expanded wings of the Privet Moth measure 30^{mm} and its body is 12^{mm} long. The general color of the moth is iridescent white, with very transparent wings, that possess opaque white veins. The anterior borders of the upper wings are light brown, and this color extends over the margin of the thorax, forming thus a continuous brown edge. Three darker brown, almost black, spots are situated just below it, and join the posterior edge of this brown border; the fourth discal spot is of the same brown color. The outside edge of the upper wings shows a very narrow brown line, ornamented towards its summit by four or five small brown dots. The outer edges, the fringes of hairs, and the posterior edges of the wings are opaque white. The white, hyaline color, a very narrow brown line with two dots near its summit on the outer edge, an opaque white fringe of hairs, a small, discal, dark brown spot, and a faint line of the same color above it, which is sometimes connected with this spot, distinguish the lower wings. The head is white, with brown eyes and trophi. The thorax, excepting its brown anterior edge, is covered with very large white and iridescent scales, which are loosely attached. The abdomen is also white, with a distinct greenish tinge; the last abdominal joints have at their edges a faintly marked brown and oblique line; the last joint in the male moth is tipped with the same color, and if the fan-like tuft is partly extended, a number of black and brown hairs are visible. The under side of the body and the legs are white; the first pair of legs are ornamented by having the upper side and tips of first joint of tarsi yellowish-brown, with a golden luster; the second pair of legs have also sometimes the tips of the upper sides of their tibiæ marked with the same color.

NATURAL AND ARTIFICIAL REMEDIES.

The sudden and quite unexpected disappearance of these insects so soon after the first brood was mainly due to the attractiveness which

the electric light possesses to these moths. Untold numbers were thus destroyed and prevented from increasing, which otherwise would have been the case, since but one parasite is known to prey upon it. From caterpillars gathered out doors, and which pupated June 25, one hymenopterous parasite issued August 2. This is a *Glypta*, and is closely allied to *rufiscutellaris*, Wesmael.

The best remedy, and one that suggests itself at once, is the trimming of the hedge at the proper time; that is, when the first indications of the presence of young caterpillars is noticeable. The trimmed shoots ought to be removed as soon as possible, at least before they have become dry, otherwise these very active caterpillars wlll undoubtedly find their way back to the hedge, and thus thwart the design. Applications of the various insecticides will also prove effective, and, owing to the protecting web of the worms, ought to be applied in form of a spray.

NOTES.

THE CHINCH BUG IN CALIFORNIA.

In Bulletin 17 of this division and also in the annual report for 1887 Mr. Howard has reviewed the subject of the Chinch Bug on the Pacific coast, and the summary of his investigation is to the effect that but three authentic occurrences of this insect have ever been known in the State of California. One was a single specimen collected in the vicinity of San Francisco in 1885 by Mr. Koebele. Another was a single specimen collected by some students of Johns Hopkins in 1884 (particular locality not known), and the third was the record by Mr. Uhler, of California as one of the States which this insect inhabits. Mr. Uhler afterwards wrote that the specimens which he had seen were collected near San Francisco, probably by Mr. Henry Edwards. The first two specimens mentioned were of a short-winged form which has been found only upon the Atlantic sea-coast, while Mr. Uhler states that his specimens were of the long-winged form. Letters addressed to Mr. Koebele in 1887 brought out the fact that he was not aware of the importance of his capture of this insect in 1885, and that he did not know just where he found the specimen referred to. Since the publication of the Bulletin, however, Mr. Koebele was reminded by its perusal of the fact that this specimen was collected upon the sea-coast, and the present spring he visited the shore near Alameda, with the result of finding a large number of specimens in the first, second, and third stages upon a coast grass which has not yet been named. Specimens have been sent for, and we hope soon to place the entire facts upon record. This large sending, however, places upon a firmer basis than ever before the occurrence of this insect in considerable numbers on the Pacific coast, although

there is as yet no evidence of any damage ever having been done in the State of California.

GERMAN PHYLLOXERA LAWS.

It may be of interest to reprint Mr. Max Leichtlin's rules for importing plants to Germany, as published in the Illustrated Monthly for General Interests of Horticulture. The directions are specifically for England, but will apply to America equally as well:

"Whoever wishes to import plants from England must instruct the nurseries to ship plants in cases, not in baskets, to pack each plant with its root-ball separately and tightly, so that they will not shake and loosen, and to enable the inspector to examine without injury to the contents. Ship through Ilse Sutton & Co., parcels express, or Best, Riley & Co., Holborn Viaduct, London, or any of their agents in the country who connect with Vlissingen. All freight suffers delay at Vlissingen. Let the shipper mark packages with the needed address of consignee, in care of T. T. Niessen, general agent, Kaldenkirchen, and prefix before consignor's domicile the word 'aus' (from), which are required custom-house formalities. If the consignees live in Heilbronn, the address should be 'f. i. N. N., ans Heilbronn, care of T.T. Niessen, general agent, Kaldenkirchen.' Finally consignee must write to T. T. Niessen, Kaldenkirchen, explaining that he is ready to pay for the phylloxera examination expenses and give him instructions how to forward, whether by freight, express, or mail."

Mr. Leichtlin says that he knows from experience that in following these directions as given the forwarding of plants will be swift, prompt, and reasonable. Any further information on the subject he says he will give with pleasure if needed.

KEROSENE EMULSION AGAINST THE CABBAGE-WORMS.

In our report for 1883, in summing up the different remedies which may be used against cabbage-worms, we mentioned the fact that for several years we had advocated the use of kerosene emulsion and stated that we were satisfied that it would prove of practical application in the field. In Bulletin No. 11 of this Division are recorded experiments by Mr. Webster, undertaken at our direction, which were favorable in their results. In accordance with this 1883 suggestion, Mr. F. E. Anderson, of the Pension Office in Washington, undertook to apply the emulsion upon his cabbages at his place, near Washington, and he has reported to us in full his results. They have not been published previously, through inadvertence, and we take this occasion to give them in his own words:

In accordance with your expressed wish to have a memorandum of my experience with kerosene as a destroyer of the Cabbage Worm, I now send you such a sketch as my memory affords.

It was in the spring of 1884 that I first put into active operation my long-desired gardening experiments. The soil was a warm sandy loam, favorable to vegetables, and I set out my cabbages—the Early Jersey Wakefields of Peter Henderson—near the end of April, there being about 400 plants. The season was exceedingly rainy, but toward the middle of June, as well as I can recollect, there came quite a severe drought, and at about this time the cabbage-flies began to appear. I had amused the neighboring farmers, who believed in "the good old ways of our fathers, sir," very much by my study of the Rural New Yorker and the reports of the Department of Agriculture, which, with Peter Henderson's "Gardening for Profit," were never out of my hands in my leisure moments; and the champions of ruts were gleeful over the anticipated failure of the "book-farmer," who, moreover, had only spare hours for his hobby and no help save his own hands. But I was not at all worried by their opinions. As soon as I saw the little white fellows making their staggering yet swift flights over my cabbages, I caught one, and recognizing him at once by the picture furnished in the report for 1883, as *Pieris rapæ*, I lost no time in preparing to give the enemy a warm reception. Not having a cow on the place, I varied Hubbard's formula by substituting common soap-suds for milk, and at dusk began to shower it upon my cabbages through an ordinary large-sized watering-pot. Owing to inexperience on my part and to the imperfect mixing of the two elements, I killed a few plants on this application, but the next evening I had learned better what to do and found myself succeeding well. In short, so complete was my victory—owing to prompt action and an early use of the remedy—that, apart from the cabbages spoilt by the first trial, I did not lose a plant. The only damage done by the worm was to a few outside leaves. As a consequence, I believe that kerosene as a destroying agent rests on a sound basis. All persons know how fatal any oil is to insects. Let a fly fall into bacon grease, for example, and though he may escape seemingly unhurt, follow him up and in a few seconds you will see him drop. The medical men remove beetles from the human ear by pouring in sweet oil. While I am no scientist, if I might venture a reason I would say that I believe it is deadly because it clogs up the breathing-pores of the insect. Kerosene well and carefully applied will do the same thing. Hence my opinion. If the application has injured plants it has been, I should judge, more through the ignorance or carelessness of the operator than through the fault of the formula.

Of course my experience is inconclusive of the matter, as I experimented on early cabbages, which are never so destructively assailed by the *Pieris rapæ* as the later varieties are, and since I was appointed to a clerkship in Washington before the season for fall cabbages was well under way; but I have tried to follow what I conceive to be the scientific method, namely, to state facts rather than fancies, no matter what results spring from them. If, in my rough way, I have gratified your wish I feel fully satisfied, for your long-continued kindness and that of Professor Riley (to say nothing of others who have shown me polite favors in your Department) have rendered me subject to obligations which I can only in part repay by signing myself,

Very sincerely, your friend,

FRANK E. ANDERSON.

P. S.—Notwithstanding my "book farmin'" you will be gratified to learn, doubtless, that I had the finest garden in my neighborhood, excepting only one, that of a rich man who could apply more fertilizer to the soil than I could.

SWARMING OF HACKBERRY BUTTERFLIES.

We have, in past years (3d Rep. Ins. Mo., pp. 151–2, Sc. American, April 6, 1878), treated of the migration of butterflies and of the exceptional swarming in immense numbers of several species, but have not known of a more striking case of exceptional abundance of a certain

species than was brought to our attention during 1887. The species in question is *Apatura celtis*, one of the Hackberry butterflies treated of at some length in the sixth report on the Insects of Missouri. The larvæ are found feeding upon the leaves of Celtis in the month of May, transform to chrysalids the latter part of the month, and issue as butterflies in the latitude of Saint Louis about the middle of June. A second brood of butterflies appears in August and the insect hibernates in the larva state at the surface of the ground.

The present spring, considerably south of the locality where we studied the species, an extraordinary swarming was noticed by two of our correspondents. Mr. Carl Holzgang, of Clay Center, Kans., wrote, under date of May 24:

> As I passed last Thursday (May 19) along the Mississippi Valley, west side, near Memphis, up the Arkansas, a swarm of millions of moths like the inclosed were flying along the road going south, etc.

On the same day (May 24) Mr. F. M. Webster, who was at that time in Arkansas, wrote as follows:

> With this I mail you * * * examples of what I take to be *Apatura celtis*. Never in my life have I observed such numbers of any species of butterfly as I saw of these along the Saint Francis River on the 14th and 15th of the present month. For a distance of about 30 miles the shores of the river were literally lined with them. On stumps they would be packed in so thick that with wings erect they completely covered the surface. The sides of the small steamer on which I was traveling were covered, and I counted 17 on the back of a deck hand as he was going about his work. When a landing was made and I got off to examine the brush, they would rise up in clouds about me and get into my eyes and mouth so that I had to beat about with a bush to protect myself. The engineer of the boat said he had been running on the river fifteen years, but never saw so many before. The inhabitants along the river were as surprised as myself. * * *

The swarming of this species in spring is the more interesting that in most other instances the swarming takes place in the autumn, and the only explanation of this exceptional phenomenon would seem to be that the conditions for successful hibernation of the larvæ were exceptionally favorable.

SOUTHWARD SPREAD OF THE ASPARAGUS-BEETLE.

The Imported Asparagus-beetle (*Crioceris asparagi* L.) is spreading gradually southward. Following the coast and the water-courses, it was found four years ago as far South as Cherrystone Creek, in Maryland, on Chesapeake Bay, by Mr. Otto Lugger, and during 1886 was found at Old Point Comfort, Virginia, by Mr. E. A. Schwarz. Inland it has spread more slowly, and never damaged asparagus beds in the vicinity of Washington until 1887. The farthest inland Southern point of which we have heard is Falls Church, Fairfax County, Va., where it did some damage in the spring of 1887.

CATERPILLARS STOPPING TRAINS—A NEWSPAPER EXAGGERATION.

The following correspondence will explain itself:

[C. V. Riley to A. P. Butler, Com. Agr., S. C., May 16, 1887.]

I inclose a clipping from this morning's Post. Can you tell me anything about the correctness of the statement?

[Clipping from Washington Post, May 15, 1887.]

COLUMBIA, S. C., *May* 15.

There are such myriads of cotton caterpillars in the Peedee Swamp, this State, that a mail train passing over the Peedee River trestle was brought to a standstill recently by thousands of these worms being on the rails and causing the wheels to slip.

[Col. A. P. Butler to Capt. C. M. Smith, agent C. C. and A. R. R., May 18, 1887.]

Please find inclosed herewith a clipping sent to this Department from Washington, D. C., from Prof. C. V. Riley, Entomologist of the United States Department of Agriculture. Is there any truth in the matter, and are the caterpillars as numerous as stated?

[Indorsements.]

Referred to J. R. Kenley, superintendent trains.—C. M. Smith.

Referred to J. F. Dunn, G. S.—J. R. Kenley.

I have had no report of a train being stopped by caterpillars.—J. R. Kenley, superintendent trains.

[John F. Dunn, general superintendent, to A. P. Butler, May 20.]

There are a great many caterpillars on the Peedee trestle, where the trains stop ordinarily on the track, and they make the track slippery, and engineers find some little difficulty in getting away, but nothing to stop the train.

INJURY BY THE ROCKY MOUNTAIN LOCUST.

Caloptenus spretus has appeared in large numbers in Otter Tail County, Minn., this year. Mr. Otto Lugger, who resigned his position as an assistant in this Division last May to accept the position of entomologist of the Minnesota State Agricultural Experiment Station, is busily engaged in superintending the work of destroying them, and will soon publish a report on this interesting outbreak. In a recent letter he informs us that the locusts are now (July 5) being killed and gathered at the rate of 500 bushels per day, persons employed for the purpose receiving the remuneration of $1 per bushel for their services. Mr. Lugger was connected with us several years in Missouri, and has for the past three years been one of our most satisfactory office assistants. He is thoroughly familiar with our methods of work, and exceedingly well posted on the habits of insects, especially those injurious to agriculture. He is, therefore, thoroughly equipped for his new post, and we congratulate Minnesota on having secured his services, which we shall miss in the work of the Division.

Early in the season we were led to hope for immunity from the Rocky Mountain Locust, as when the young first began to appear in Minne-

sota they were determined from Illinois as not the migratory species, but as belonging to some of the local non-migratory kinds. M. Lugger has had the hearty co-operation of the State authorities and especially of the governor of the State, and we shall look forward to his report with much interest.

THE PERIODICAL CICADA IN 1888.

During the present year two broods of the Periodical Cicada or so called "Seventeen-year Locust" (*Cicada septendecim*, L.), one of the seventeen-year (*septendecim*) race and one of the thirteen-year (*tredecim*) race, have made their appearance in different parts of the country.

The following is a list of localities in which they are supposed to have appeared, and we shall be pleased to receive any information, confirmatory or otherwise, from persons who may receive this bulletin, as we are desirous of definitely limiting the extent of country over which these broods appear.

BROOD V.—*Septendecim* (1854, 1871, 1888).

Wisconsin.—Waukesha, Walworth, Jefferson, Rock, Green, Dane (?), Iowa, Grant, Crawford, Richmond, Sauk Counties.

Iowa.—Mitchell, Howard, Winneshiek, Allamakee, Clayton, Fayette, Chickasaw, Floyd, Bremer, Butler (?), Dubuque, Delaware, Buchanan, Black Hawk, Jackson, Jones, Linn, Benton, Clinton, Scott, Cedar, Johnson, Muscatine, Louisa, and Des Moines Counties.

Illinois.—All of the northern counties. The boundary line, in a general way, may be drawn from the northwest portion of Mercer County, southeast to the Illinois River at Peoria, west along the Toledo, Wabash and Western Railroad. There seem to be detachments extending farther south, especially in the eastern portion of the State, and they occur as far south as Shelby County.

Indiana.—The boundary in this State is not well-defined, but includes the extreme northwest counties, extending as far south as the Kankakee River.

Michigan.—In this State the southern tier of counties extending from Lake Michigan east to the middle of the State.

Pennsylvania.—Lancaster County; the southeast by eastern portion, known as the "Pequea Valley." This locality was not verified in 1871, although there is no doubt of the appearance of the insect in immense numbers in 1854.

BROOD X.—*Tredecim* (1849, 1862, 1875, 1888).

Texas.—We are particularly desirous of verifying this brood. Its existence now rests on the single statement by Dr. Gideon Smith that he was informed that the insect appeared in vast numbers in parts of Texas in 1849, but that he was not able to get any particulars. 1875 did not furnish any information concerning this brood; hence our desire for full and accurate returns from Texas this year.

THE CHINCH BUG IN 1888.

The long continued rains extending over a large part of the Chinch Bug territory during the late spring and early summer the present season have done much to verify our prediction on page 31 of Bulle-

tin 17, that the present season will be one of comparative immunity from the attacks of this insect. We learned early in spring of the successful hibernation of the bugs in large numbers in Wisconsin, Minnesota, Iowa, Missouri, Kansas, and South Carolina, but later information shows that the heavy rains have killed them off in great numbers. July returns, however, show some slight damage. The two worst reports have come from Chesterfield, S. C., and Cadet, Mo., but these are not alarming.—L. O. H.

INCREASE AND DIVERGENT HABITS OF CRYPTOCEPHALUS VENUSTUS.

Mr. John D. Lyons writes us from Monticello, N. Y., that *Cryptocephalus venustus* has become very plentiful this year in that locality. It does not seem to do much damage to anything, but it is interesting to note that it is found on the Potato in preference to other plants, and on the Tomato, Pumpkin, and Cucumber if the Potato is not convenient.

THE HESSIAN FLY HALF-WAY AROUND THE WORLD.

The Hessian Fly, *Cecidomyia destructor*, has reached New Zealand The March, 1888, number of the *New Zealand Farmer* reports it from four different farms in the Rangitikei district, one of these being at Bellevue, near Marton, a town 33 miles southeast of Wanganui, in the state of Wellington.

EAU CELESTE FOR THE ROSE BEETLE.

It is interesting to note that the *eau celeste* (blue-water, a simple solution of sulphate of copper, with ammonia), recently recommended by this Department as a remedy for mildew, at the same time rids plants of the Rose Beetle when they are so infested. Col. A. W. Pearson, of New Jersey, states that it not only saved his vines from injury by mildew, but also rid them entirely of millions of these beetles, which were threatening to destroy the fruit and foliage entirely.

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PERSONNEL OF THOSE ENGAGED IN GOVERNMENT ENTOMOLOGICAL WORK.

The following list embraces those now engaged in Government entomological work and who will assist in the management of the periodical, those at Washington editorially, and the others as contributors. The force of the Division of Entomology is more or less inconstant, as it consists of both permanent and temporary employees:

DIVISION OF ENTOMOLOGY, U. S. DEPARTMENT OF AGRICULTURE.

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Office staff: L. O. Howard, First Assistant; E. A. Schwarz, Th. Pergande, Tyler Townsend, W. B. Alwood, Assistants.

Agents: Saml. Henshaw, Boston, Mass.; F. M. Webster, Lafayette, Ind.; Herbert Osborn, Ames, Iowa; N. W. McLain, Hinsdale, Ill.; Mary E. Murtfeldt, Kirkwood, Mo.; Lawrence Bruner, West Point, Nebr.; D. W. Coquillett, Los Angeles, Cal.; Albert Koebele, Alameda, Cal.

DEPARTMENT OF INSECTS, U. S. NATIONAL MUSEUM.

Honorary Curator: C. V. Riley.
Assistant Curator: John B. Smith.

U. S. DEPARTMENT OF AGRICULTURE.

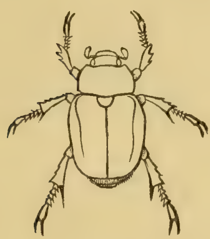
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. AUGUST, 1888.

Vol. I. No. 2.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS, WITH THE SANCTION OF THE COMMISSIONER OF AGRICULTURE.



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THE YELLOW-SPOTTED WILLOW-SLUG.

(*Nematus ventralis* Say.)

[Order HYMENOPTERA: Family TENTHREDINIDÆ.]

By L. O. HOWARD.

WILLOW AND WILLOW WARES.

The willow ware industry has been slowly increasing in our Eastern States of late years, but is as yet in its infancy. The immense unutilized areas of land along our many rivers, portions of the sea coast, and of some uplands and prairies not suitable for any other agricultural pursuit, invite capital and energy to invest in the production of osier, chiefly for the manufactury of basket ware. According to the census of 1880 there were in the country 304 willow-ware establishments, with a capital of $1,852,917, engaging 3,119 hands, paying annually the sum of $657,405 for wages, and producing $1,992,851. The value of materials consumed was $867,031, of which, however, but a portion was produced here. The importation of both raw and manufactured material will be greatly reduced, and the demand for willow ware materially increased if the profit to be derived from a systematic production of osier becomes once better generally understood.

The various species of willows, including those with tough twigs suitable for basket making, are greatly affected by insects, and one of the worst is this slug or saw-fly, observations upon which have been recorded in past years by Professor Riley in the New York Tribune for July 13, 1872, while his note-books contain records of many observations made in subsequent years. The following statements are drawn up from these notes and from others made by Mr. Lugger and myself during the summer of 1887:

NATURAL HISTORY.

If not checked by natural or artificial remedies, six or seven broods of this insect are possible in the Central and Southern States. Our records for 1886 show that these flies were abundant and depositing eggs

May 20, July 1, July 17, August 2, September 7, October 12, and October 19; full-grown larvæ were observed May 11, May 22, June 16, July 6, August 13, September 13, and October 14.

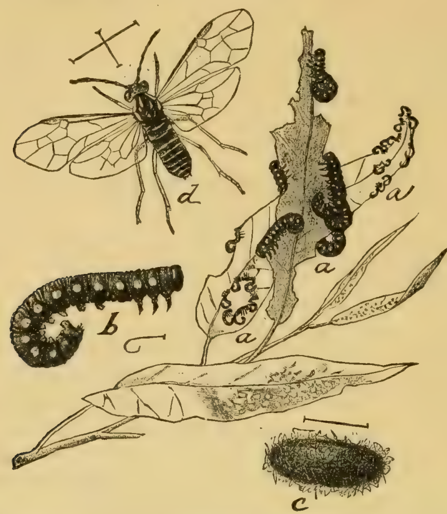

FIG. 5.—NEMATUS VENTRALIS. *a, a, a,* young larvæ; *b,* full-grown larva; *c,* cocoon; *d,* adult; all slightly enlarged (original).

In the grounds of the Agricultural Department in Washington these slugs were extremely abundant upon isolated willows on July 6; eggs were deposited July 17, which produced the second brood. A third brood became numerous August 2; eggs for the fourth brood were deposited September 7, and eggs for a fifth brood hatched October 14. No saw-flies had been observed during the previous year nor prior to July 6, thus showing that they came from some other willows, and that the larvæ then noticed were the offspring of females of a first or perhaps second brood, which had been forced to search for new breeding-places, the former food supply having become exhausted.

The number of broods on these isolated willows could be studied with great ease, since each brood of slugs consumed in turn nearly all the younger leaves in the course of their larval existence. Before the winged flies appeared and before their eggs had hatched, the young leaves and shoots had attained quite a size, and offered enough suitable food for a new brood to feed to full growth. In larger patches of willows such observations are more difficult, because in the course of time the several broods overlap each other, so that in late summer slugs of all sizes can be found at the same time, and there is no indication of the brood to which they belong.

INJURIES AND APPEARANCE OF SLUGS.

All kinds of willows, with the exception, perhaps, of the weeping willow and species growing into tall trees, are injured by these slugs; the imported yellow or golden osier willows do not escape. Yet the species and varieties of the white willow seem to be preferred, at least they are first attacked if a variety of food is offered. Young poplars growing in close proximity to the willows, were injured as well, and only their older and harder leaves escaped. Such poplar leaves, frequently utilized by the female saw-flies for oviposition, were not used as food until the willow leaves became scarce and hunger forced the slugs to search for other food plants allied to willow. Nor are eggs inserted into poplar leaves until willow leaves for this purpose are lacking. The greatest damage is done to young plants, and this is one redeeming character of this insect, as insecticides are much more readily applied to them.

The defoliation of the young willow plants is bad enough by itself, and if repeated several times in the same season or in consecutive seasons will no doubt kill them. But still another injury is inflicted which renders such defoliated twigs useless as osier. Whenever the plant is forced to produce a new set of foliage the new leaves do not simply replace the lost ones, but grow from new side shoots, thus destroying the usefulness of the original shoot, which for commercial purposes should be of uniform texture throughout its whole length.

The first indication of the presence of these slugs on the willows is the peculiar little blister like swellings seen upon the upper surface of the leaves and which sometimes give them a wavy or crumpled appearance. If an individual leaf is investigated these swellings are seen to be occasioned by the oval, whitish eggs, which are partly inserted into the under surface of the leaf-substance. As the eggs approach the time of hatching black spots and streaks appear around them, which are the effects of the numerous wounds made upon the leaves. As soon as the young slugs appear they commence to gnaw small holes, which soon increase in size. The numerous slugs born in the same leaf feed usually in close proximity to each other, but they can not, however, be called gregarious. Their slimy black color and filthy moist excrement soon reveal their presence. As they grow in size they devour the whole leaf and soon denude the plant, leaving only the thicker portions of the mid-ribs untouched. The slugs make no attempt whatever to hide, in spite of their conspicuous markings, but are plainly visible everywhere. They can always be distinguished by the peculiar curved position of the posterior segments, which frequently bend away from their true legs in the form of an interrogation mark.

THE DIFFERENT STAGES.

The Egg.—As in the great majority of saw-flies, the female of this species is provided with two saws under the posterior part of the abdo-

men, which are used to cut fine slits into the leaf-substance, into which the eggs are pushed. Here they increase to almost twice their original size by absorbing the sap of the plant through their very thin shells, thus preventing their dislodgment until hatching time. The under side of the leaf is invariably utilized for oviposition. The appearance of oval bladder-like projections upon the upper surface of the leaf is produced by the eggs, as already mentioned. They show still more plainly upon the lower surface, where it is seen that the eggs are only partly imbedded in the little pockets produced by the saws of the female. If the leaf substance at the time of cutting these slits is still soft and yielding the whole egg is snugly imbedded; otherwise one-third and even one-half of the egg projects outside. The egg itself is quite large in proportion to the mother insect, measuring fully 0.3^{mm}. in length. It has a long oval shape and is one-third as wide as long. These translucent, greenish eggs are quite numerous, as each female lays on an average about eighty eggs at a time, and since—in time of scarcity of young foliage—several females sometimes select the same leaf, as many as two hundred eggs have been counted upon a single leaf. The eggs deposited later in these leaves by a second female are usually destroyed, because the offspring of the first batch of eggs commence feeding as soon as born and devour the leaf, together with the inclosed eggs. In the course of four to eight days the young slugs are hatched. The time of incubation varies and is controlled by the prevailing temperature.

The Larva, Pupa, and Cocoon.—When the young larvæ leave their egg-shells, they are at first white, with a small blackish eye-spot on each side of the head, which is already visible through the shell of the unhatched egg. This white color soon disappears, and later the slugs are shiny black, transversely wrinkled, and ornamented with ten large and two smaller yellow spots on each side of the body along the stigmatal region. A slimy matter oozes out of their skin and covers them entirely. The large yellow spots are very prominent only after the last molt; but they are already vaguely indicated in the younger specimens, which are moreover frequently marked by a narrow, yellow longitudinal dorsal line. Often there are but ten spots, the ones upon the first thoracic and last abdominal segment being either quite small or lacking. The head is polished black, free, perpendicular, and as large as the first segment. Besides the three pairs of long, black, jointed feet, of which the first pair is shortest and the third longest, the slugs possess six pairs of light blue prolegs and a seventh pair of very imperfect anal ones.

The larvæ undergo four molts, and attain maturity in from ten days to three weeks. When full grown, they measure fully 20^{mm} in length, and ceasing to feed, enter the ground where they form shiny, glue-like cocoons, of a dark bronze color. These cocoons are double, and consist of a rough outside layer inclosing a smooth and tough

inner one. If larvæ of this species are confined to breeding cages without earth, they form their cocoons among or under the dead and fallen leaves. Within these cocoons they change to yellow pupæ, which in the course of a week give forth the winged insects.

The Imago.—The winged insects are dull and heavy in all their motions, and depart greatly—like most saw-flies—from the general character of the order to which they belong. They possess neither the powerful jaws of the predaceous tribes, nor the slender jaws and tongues of the honey-feeding families. When the females are engaged in sawing slits in the leaves for the reception of their eggs, they are not easily disturbed in their work. The males, however, are more active, being one third shorter, and not as bulky as their females. The color of both sexes is black; the female has the venter, tibiæ, palpi, and the base of the wings of a decidedly bluish-green color; the edges of the abdomen and obsolete bands between the segments are pale yellowish. The same parts in the male, and more or less of the upper surface of the abdomen, are yellowish-brown or orange colored. The female averages 8^{mm} in length and the male 6^{mm}.

NATURAL ENEMIES AND REMEDIES.

No parasite has as yet been found to attack the larvæ. The eggs however, are frequently destroyed by very small Chalcids of the genus *Trichogramma* which become numerous when the second brood of females is ovipositing.

The Wheel-bug (*Prionidus cristatus*) has been of very great service in reducing the numbers of these slugs. At a time during the summer of 1887, when the willows were threatened with total extinction, a number of these useful bugs stationed themselves upon the infested twigs and impaled every slug that could be found upon the same twig. Towards the end of the fourth generation the willows recovered somewhat and put out new foliage, and the slugs became so very scarce that the Wheel-bugs found it no longer profitable to remain.

The English Sparrows, although flocking in large numbers to some sun-flowers that grew very close to and among the willows did not eat a single slug; their whole attention was directed to the ripening seeds of the Sun-flower.

As to remedies, no insect is more readily destroyed than this by the use of arsenical solutions.

NOTES ON EUMAEUS ATALA.

By E. A. Schwarz.

By far the most conspicuous insect in semitropical Florida is *Eumaeus atala*, a butterfly which on account of its abundance and brilliancy in coloration can not fail to attract at once the attention of the en-

tomological visitor. The structural peculiarities of the larva and pupa of *Eumaeus* have been discussed by Mr. Samuel H. Scudder,* but he hardly refers to the life history of the species. Another description of the earlier stages seems to be given by F. Poey in his work on the Lepidoptera of Cuba, but I have not been able to consult the work. It is not quoted by Scudder but may contain a full account of the life history of *Eumaeus.* At any rate, even if duplicated, it will do no harm to place on record the following short observations made independently last year during a stay at Cocoanut Grove, Dade County, Fla.

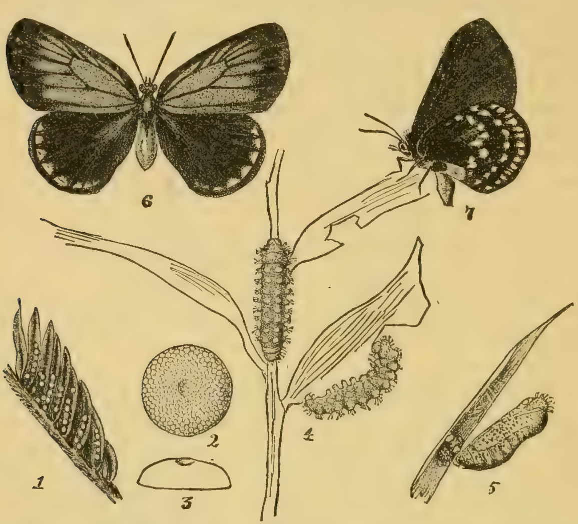

Fig. 6. EUMAEUS ATALA: 1, eggs in situ—natural size; 2, 3 eggs—enlarged; 4, larva; 5, pupa; 6 adult from above; 7, adult from side—all natural size (original).

The species is so frequent and so tame in the pine woods between the shores of Biscayne Bay and the Everglades that it is the easiest thing in the world to gather some observations on its natural history. Its only food-plant in Florida is *Zamia integrifolia* of the family *Cycadacea,* a plant which is not unlike a large fern and whose original home is the West Indies. That this plant is of considerable economic value wherever it occurs in abundance is a well-known fact, but it may not be generally known that it furnishes almost the only means of subsistence of the present population of the shores of Biscayne Bay and of the mainland southward thereof. The subterranean stem of the plant, when ground up by means of very simple and cheap machinery, fur-

* The structure and transformation of *Eumaeus atala.* Memoirs Boston Soc. Nat. Hist., vol. ii, pt. iv, No. iii, 1875, p. 413–419, pl. xiv.

nishes a starch of excellent quality, and this when shipped to Key West, the emporium of southern Florida, always commands a good price in cash. The larva of *Eumaeus atala*, which is popularly known as "Coontie Worm,"* would therefore be an injurious insect, since it often entirely defoliates large bushes of the *Zamia*, but the plant is so abundant and possesses such indestructible vitality that the damage is reduced to a minimum.

The brilliant red larvæ abound everywhere on the plants, and if they have not defoliated the latter, the cream-colored, echiniform eggs, or rather the egg-shells, may be easily found by examining the under side of the leaves. Here they are in more or less regular rows of three or four or even five upon each leaflet, and there is also sometimes a regular row of eggs along the main rib of the leaf. The butterfly, however, never oviposits on such fully developed leaves, but always chooses the young shoots when these are still curled up and the leaflets closely folded together.

The female butterfly alights upon a young shoot and the leaf bends down under the weight of the insect, which thus remains with its legs upwards when ovipositing. It takes a long time before the female has selected a suitable place for the depositing the egg, and this is finally laid with a great effort, so that the insect has to rest for two or three minutes before going on with her work. The second egg is laid close to the first, and usually a third and sometimes also a fourth or fifth are laid in a row on the same leaflet. Then the female proceeds to the next leaflet above or beneath the first, or chooses another one, but always close to the first place. I timed a female which had just laid one egg, and found that thirty-two minutes afterwards she had laid only 13 additional eggs. The number of eggs to be found on a single leaf varies greatly; sometimes only two or three are found (the insect having evidently been disturbed by a sudden gust of wind or otherwise), but usually much more, and as many as thirty-five were counted. When the female has finished ovipositing the leaf gets again erect, and thus the eggs are first on the upper and outer sides of the leaf, but in the course of a few days the leaf unfurls and the eggs, long before they hatch, are on the under side of the leaflets. With the expanse of the leaflets the intervals between the individual eggs increase, and the rows of eggs do not longer appear so regular as when the leaflets were still closed.

Duration of the egg state in the month of May at least ten days; that of the larva at least a fortnight; the pupa state lasts between nine and ten days. During the month of May the species could be found in all stages in the pine woods along the shores of Biscayne Bay, and it seems that in the mild climate of that section it breeds the whole year round.

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* "Coontie" is the Indian name for Zamia integrifolia; the white settlers call the plant "Contie" or "Comtie."

Although, on account of the prevalence of the house ant (*Monomorium pharaonis*), I was unable to breed indoors the butterfly from the egg, still I bred many imagos from the half or nearly full-grown larvæ, and frequently young larvæ from the eggs, but in no instance did I obtain a single parasite from the eggs, larvæ or pupæ. The butterfly seems likewise to enjoy perfect immunity from natural enemies, since it can be readily approached and captured with the hand. Still, nature has provided against an undue multiplication of this butterfly. If plenty of young shoots happen to be on one plant every one of these, or at any rate most of them, are covered with the eggs, and the caterpillars have defoliated the plant long before they are full grown. They then begin to migrate in search of new food, not in a body, but scattering in all directions, and, since the plants are usually not so very close together and the rocky ground most unfavorable for locomotion, most of these migrating caterpillars perish from starvation. Moreover, untold thousands of them are destroyed by the fires which frequently sweep through the pinewoods.

In regard to the geographical distribution of *Eumæus* Mr. Scudder has already pointed out that it does not extend so far north as its food-plant. This last occurs still around Crescent City, but the butterfly is even no longer to be found on the southern end of the Indian River, nor did I see it in the pine woods opposite Lake Worth. It was still quite abundant about 3 or 4 miles north of Miami River, but here the coral formation rapidly sinks below the level of the ground, and the pine woods assume the character of what is known as "flat woods," where *Zamia* does not occur. It is thus safe to assume that *Eumæus atala* does not attain the northern end of Biscayne Bay. Scudder mentions its occurrence on Key Biscayne, which is almost due east of the mouth of Miami River, but I think this must be a mistake, since the narrow strip of sand which forms Key Biscayne did not harbor at the time of my visit a single specimen of the food-plant. Southward it occurs on Elliott's Key and Key Largo and on the mainland perhaps so far south as Cape Sable, but is absent on most of the smaller keys south of Key Largo. In southwestern Florida, as I have been informed, the food-plant extends so far north as the still *terra incognita*. I can not tell whether or not the butterfly occurs there.

The accompanying figure, which Professor Riley has had drawn by Miss L. Sullivan, does not need any further explanation, nor is it the intention of the writer to enter here into descriptive details. The silken thread which girdles the pupa has been accidentally omitted in the photo-electrotype.

SUPPLEMENTARY REPORT ON THE GAS TREATMENT FOR SCALE INSECTS.

By D. W. COQUILLETT.

Since writing my "Report on the gas treatment for scale insects," which forms part of Professor Riley's annual report, published in the Report of the Department of Agriculture for the year 1887 (pp. 123–142), I have made a number of observations on this treatment, the more important of which are recorded below.

There is a great difference in the relative strengths of the best grade of the various brands of potassium cyanide. In this city (Los Angeles) the two brands most commonly offered for sale are the Powers & Weightman, manufactured at Philadelphia, Pa., and the Mallinckrodt, manufactured at Saint Louis, Mo. A careful analysis of each of these brands by Prof. E. M. Wade, an analytical chemist of this city, showed the Powers & Weightman cyanide to contain fully 99 per cent. of pure potassium cyanide (KCN), while the Mallinckrodt contained only a fraction over 93 per cent.; and several experiments which I have made with each of these brands fully confirm the correctness of the above analyses in favor of the Powers & Weightman cyanide.

Either of these brands of cyanide will dissolve in a few hours in cold water, only requiring to be frequently stirred. When thus dissolved, the solution does not emit the disagreeable odor of ammonia, which is emitted by the solution made by boiling. The solution made without heat is evidently stronger than the other, since heat decomposes the cyanide; and several tests which I have made with the cold solution indicate that it is stronger than when made by boiling. Moreover, the cold solution is more liable to be of a uniform strength, since in the other the boiling water will take up more of the cyanide than it can retain, and upon cooling will deposit the excess in the bottom of the vessel.

The Powers & Weightman cyanide will dissolve in about half the time required by the Mallinckrodt. The latter solution, after standing a few hours, assumes a reddish-brown color, but the solution of the Powers & Weightman cyanide does not change color, remaining of a light, olive-gray color for an indefinite length of time.

The proportions are as given in my report, namely, 5 pounds of the cyanide to 1 gallon of water. When dissolved, the solution will measure about 168 fluid ounces, each pound of the cyanide having added 8 fluid ounces to the solution. Two fluid ounces of the solution will contain about 1 ounce by weight of the cyanide, and will require 1 fluid ounce of sulphuric acid (commercial) to evolve the gas from them. One ounce by weight of the dry cyanide will require about 2¼ fluid ounces of sulphuric acid to evolve the gas from it.

A wholesale firm in this city offer to furnish either of the brands of cyanide mentioned above at the rate of 65 cents per pound when purchased in quantities.

The second or drying vessel of the gas generator should be much larger than the one shown in Plate VI of my report. This vessel should be at least 10 inches in diameter. The leaden pipe which conveys the gas from the generator proper to this second vessel should enter one side of the latter near the top and then curve downward until its lower end is within about an inch of the bottom of the vessel. When in use the bottom of this vessel should be covered with sulphuric acid to a depth of 3 inches, and after the gas has passed through it enough of the acid should be drawn out of this vessel to generate the gas the next time, and fresh acid be added to replace that drawn out.

The generator proper should be furnished with *two* vessels above, instead of one—one for the acid and the other for the solution.

EXTERNAL SPIDER PARASITES.

By L. O. Howard.

In Hardwicke's Science Gossip for July, 1888, a spider from Ceylon is figured with a parasitic Ichneumonid larva *in situ* upon its back. The adult parasite is also figured, and the accompanying note, which is by Mr. E. Ernest Green, of Pundiloya, Ceylon, states that the Ichneumon appears to oviposit upon the female spiders only, and that the spider continues to feed and remains in apparently good health until the larva is full-grown. The larva then spins a flask-shaped silken cocoon and attaches it to a leaf. No identification of the spider or the parasite is made by Mr. Green, although he states that the latter is possibly allied to the Pimpla mentioned by Packard as being parasitic upon a spider in Europe. A glance at his figure, however, shows that the parasite belongs to the Ichneumonid genus *Polysphincta*, the species of which are well known to be parasitic upon spiders, their larvæ feeding externally, as pointed out by Mr. E. A. Fitch in the Entomologist some six years ago. A similar case in America was for the first time mentioned by the writer in a communication to the Entomological Society of Washington, not yet published. In this case the parasitic larva was apparently less than half grown, and it was killed without rearing the adult. The specimen was captured by Dr. W. H. Fox, of Washington, in February, which would indicate a larval hibernation of the parasite. Dr. Fox's larva differed greatly from the full grown *Polysphincta* larva as figured by Fitch, but this may be due to the fact that it had not reached half its ultimate size. The spider upon which it

was found was a young specimen of *Steadota borealis* Hentz. The larva was slender, cylindrical, white, 1 millimeter in length, and was very firmly attached to the front of the dorsum of the abdomen of the spider in a transverse position. Mr. Fitch, in the article above mentioned, quotes observations by De Geer, Westwood, Blackwall, Laboulbène, Snellen van Vollenhoven, Brischke, and Parfitt, and records two new instances from specimens found by Rev. H. Matthews and Mr. G. C. Bignell. In the same volume Rev. O. P. Cambridge records two further instances from his own observations.

It is a very common thing to rear parasites from the egg-bags of spiders, but much rarer to find parasitic larvæ feeding upon the adult spiders; still from the instances mentioned above such cases have not infrequently been observed in Europe. Mr. Fitch makes the sweeping statement that the species of the genera *Polysphincta* and *Acrodactyla* "are probably exclusively spider vampires," and so positively does he rely on this generalization that he states that Brischke's record of *Polysphincta carbonarius* from a saw-fly is probably an error. In this, however, he is probably at fault, for there are other European records of the rearing of *Polysphincta* from saw-flies and from longicorn larvæ, and in this country Professor Riley has several species of this genus which have been bred from lepidopterous larvæ. Moreover, the *P. albipes* of Cresson was bred by Comstock from a lepidopterous cocoon found on an orange leaf in Florida (Rept. Dept. Agr., 1879, p. 208).

THE SWEET-POTATO SAW-FLY.

(*Schizocerus ebenus* Norton.)

[Order HYMENOPTERA; family TENTHREDINIDÆ.]

In the summer of 1886 Mr. C. Wercklé, of Ocean Springs, Miss., wrote us that a neighbor was troubled with worms which destroyed his sweet-potato crop, and in August, 1887, he was able to secure specimens, which he forwarded to the Division, and from which we were enabled to determine the insect as a rather rare Saw-fly, described by Norton in 1867 from male specimens collected in New York as *Schizocerus ebenus* (see Trans. Amer. Entom. Soc., Vol. I, page 55). The first installment sent by Mr. Wercklé consisted of pupæ only. These were received August 18, 1887, and from them adults issued August 19. September 6 larvæ were received from him, possibly of another brood, and from these adults issued September 19. We also, at the same time, reared from the cocoons a Braconid parasite belonging to the genus *Eubadizon*, differing from any species of this genus hitherto described in this country and which we shall describe in a more appropriate place

under the name *Eubadizon schizoceri.* It is illustrated at Fig. 8. We also reared an undetermined Tachinid. Mr. Wercklé also stated in one of his letters that the eggs were laid in the leaves and looked like

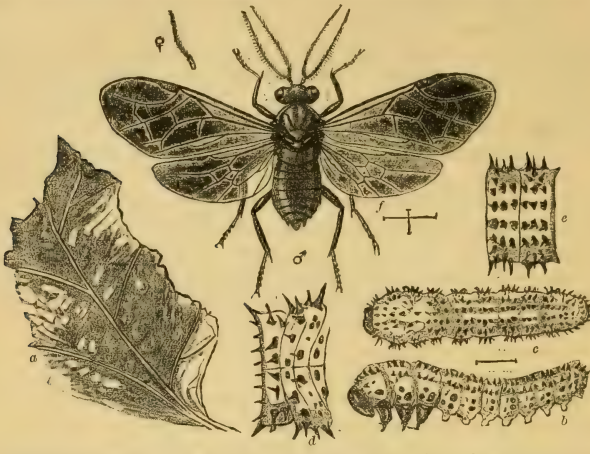


FIG. 7. SCHIZOCERUS EBENUS. *a*, leaf showing eggs in situ—natural size; *b*, larvæ from side; *c*, same from above—enlarged; *d*, thoracic segments of same; *e*, abdominal segments—still more enlarged; *f*, adult male—enlarged (original).

rows of scale insects. The pest was observed for the first time in 1886, when the larvæ completely defoliated large tracts in a sweet-potato field on a farm lying at some distance from any other.

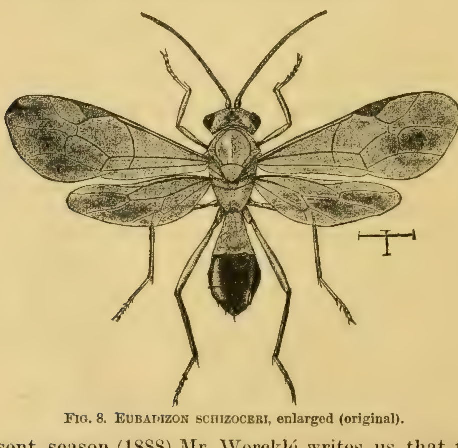


FIG. 8. EUBADIZON SCHIZOCERI, enlarged (original).

The present season (1888) Mr. Wercklé writes us that the pest has not been noticed since September, 1887. The adult insect is a small

four-winged creature, about the size of a common house-fly or a little smaller. It is black, and the wings are dusky. The female abdomen is yellowish-brown. The insect is shown in figure 7 in egg, larva, and adult. The larvæ figured are, however, not full grown. We mention this pest here but briefly, as our observations upon it are by no means complete, and simply to place the fact on record and to elicit any information which others may possess upon the subject.

THE MORELOS ORANGE FRUIT-WORM.

(*Trypeta ludens* Loew.)

[Order DIPTERA: Family TRYPETIDÆ.]

By C. V. RILEY.

We have for some time been aware of the existence in Mexico of a worm which damages the fruit of the Orange, boring into the pulp and rendering it unfit for eating purposes. It has been described to us by non-naturalists as a large, white worm of perhaps an inch in length, of which no sign could be seen from the outside of the fruit. The existence of such a fruit-worm in Mexico has always seemed important to

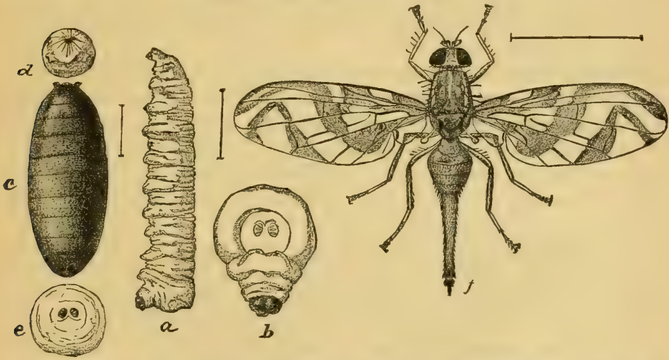


FIG. 9.—TRYPETA LUDENS. *a*, larva enlarged; *b*, anal segment of same form behind—still more enlarged; *c*, puparium—enlarged; *d*, *e*, head and anal segments of same—still more enlarged; *f*, adult female—enlarged (original).

us on account of the danger of importation into the orange-growing regions of the United States, and we have several times instructed our agents who were visiting New Orleans, into the markets of which Mexican oranges are largely imported, to search for infested fruit. Mr. Howard in 1884 ascertained that the fruit dealers in New Orleans were familiar with the existence of such a worm, but during the time at his disposal he was unable to obtain specimens. In the summer of 1887, however,

Mr. Bruner went to Mexico upon leave of absence for a collecting trip, and was urged, incidentally to the other objects of his trip, to look into this matter and to secure specimens, if possible, of the worm in question. He ascertained from conversation with intelligent Mexicans that there were probably three worms which injured the fruit of the Orange in that country. The one was a worm which works only in the skin of the fruit in the States of Michoacan and Jalisco, but which, from description, appeared to be a Tortricid. Another worm was described as being short and thick and working inside the fruit in the same States. He was unable to learn of any work in the fruit in the States bordering upon the Gulf of Mexico. The third worm was found by Mr. Bruner, and the imago obtained from specimens which he brought home. These proved to be *Trypeta ludens*, according to Loew's excellent description and figure.* The notes made by Mr. Bruner upon finding the first specimens are as follows:

"Upon opening an orange to eat it was found to contain a couple of holes immediately under the skin, penetrating into the interior. Further investigation showed the orange to contain eight dipterous maggots measuring 10^{mm}. in length. A careful examination of the outside surface revealed no signs of entrance, but the inner pulp of the peel contained a minute perpendicular burrow, which was continuous with that of the hole in the interior of the fruit. The eggs were evidently deposited in one of the pores of the skin or upon its surface, from which the freshly-hatched maggots entered."

The following note was sent to us after his return to West Point:

"The second orange containing the maggots that came to my notice was on the train. This, like the preceding, showed no outward signs of occupancy by an insect enemy. I then obtained permission to examine a lot of upwards of five hundred oranges coming from the same locality, out of which four were selected as such that might contain the worms. All of these latter showed more or less well-defined outward signs of the depredations of some insect enemy. One of these at least I am sure contains the grub, for upon my arrival home I found a freshly-made hole coming to the surface and saw one of the maggots protruding, that afterwards was made to re-enter. The oranges were placed in jars to breed the flies. Would forward some of them to you only that the weather has again turned quite cold and I am afraid to risk them in transit."

So far as Mr. Bruner was able to ascertain, this worm is most abundant in the oranges raised in the State of Morelos, 100 miles south of the City of Mexico, and the statement was made to him while in the City of Mexico that oranges from Morelos were very liable to be thus infested. Mr. Bruner returned to Nebraska early in December, and upon December 30 wrote us that several of the larvæ had pupated. The larvæ be-

* Review of N. A. Trypetina, Mon. Dipt. N. A., Part III, Sm. Inst., 1873, p. 223, Pl. XI, Fig. 19.

gan to issue from the fruit December 22. The fruit itself had rotted and molded, and about one-half the pulp had been devoured, although the outside did not show it. In this particular orange the spot where the decay began was where the fruit came in contact with the moist sand at the bottom of the breeding-jar.

In February he wrote that the adults had begun to issue, the first one appearing February 9. A number of specimens of both sexes were thus reared, and the experiment was tried of confining them with ripe fruit to see whether they would oviposit in the orange if not on the tree. This experiment, however, failed, and none of the flies laid eggs, all dying after a number of days. It is doubtful, however, whether this can be taken as evidence against the possibility of damage to picked fruit.

The larva, pupa, and adult of the insect are illustrated at figure 9, and these figures will enable the ready identification of the insect, so that few words of description are necessary. The full-grown larva is three-eighths of an inch in length, of a dirty white color, with the extremities brownish. Its shape is shown in the figure, and it may be readily distinguished from other larvæ so far known to affect oranges by the two anal spiracles, each with its three transverse slits. The puparium is shorter, oval, and of a dark-brown color. The general color of the perfect fly is ochre yellow, with slightly darker markings, as indicated in the figure. The markings on the wings are yellowish toward base and smoky toward tip.

There is little to say upon the subject of the possibility or probability of the introduction of this pest into the orange districts of Louisiana, California, and Florida. The fly is very hardy, and Mr. Bruner states that while in confinement it withstood considerable neglect, as well as more than ordinary variation in temperature, the mercury on several occasions falling some degrees below the freezing point in the room where his breeding-cage stood. So far as we can learn the New Orleans markets are mostly supplied with fruit from the Gulf States, where this insect does not occur, and the oranges from Morelos go north by railroad into the regions widely remote from any American orange-growing section, so that the probability of introduction would not seem to be great, although the possibility always exists and is becoming greater with the extension of railroad connection and facilities for traffic.

The habits of this species do not seem to have been described before. *Ceratitis capitata* (= *C. citriperda*), however, a species of the same family, attacks oranges in Madeira, according to Osten-Sacken (Entom. Monthly Mag., xxi, 34, July, 1884).

KEROSENE EMULSION AS A REMEDY FOR WHITE GRUBS.*

On June 1, last, Mr. Cogan, superintendent of lawns at the Capitol grounds, brought to the Division specimens of the larvæ of *Allorhina nitida* and stated that they were doing serious injury to the lawns under his care. This afforded an excellent opportunity for experimenting with kerosene emulsion, and Mr. W. B. Alwood was instructed to visit the grounds at once and to conduct a careful series of experiments and observations. The results have proved most satisfactory and there seems little question but that we have found a certain and easy remedy for these destructive creatures. The ordinary White Grubs (larvæ of *Lachnosterna* spp.) will unquestionably be affected in the same way. We give Mr. Alwood's report in his own words:

REPORT BY W. B. ALWOOD.

The plat affected was of irregular outline; on a large portion of it the grass was already killed and a considerable portion of this was bare of herbage of any kind. The soil was everywhere full of worms, averaging about six to the square foot of earth.

A small plat was treated with kerosene emulsion diluted fifteen times.

June 7, visited the grounds again. Where the keresene emulsion had been used the grubs had been immediately sickened and were now lying 2 to 4 inches below the surface, not eating. Mr. Cogan said that the next day after the treatment he had dug up several grubs which were sick and soon died *when exposed to the air and sunshine.* I found no dead ones in the soil. The grass was uninjured. This treatment seemed promising and on the 8th of June, under direction of this Division, Mr. Cogan treated the entire area with kerosene emulsion diluted fifteen times. For this purpose 15 gallons of emulsion were prepared, requiring 10 gallons of oil, and about 5 pounds of soap were used. This would give some 300 gallons of diluted wash. This was applied liberally to the soil, which was for some days kept freely soaked with water.

June 11 I visited the grounds again. The grubs over the whole area had turned down into the soil and seemed sick; when dug out were so weak they could scarcely crawl.

No dead ones were found. The green grass had not been injured by the application. Mr. Cogan was requested to keep the soil well watered and observe what further results followed.

On June 27 the grounds were again visited. The grass which was not killed by the grubs had recovered very much; where grass had been killed wild grass and weeds are growing in. The grubs are still in the

*The "White Grubs" in this instance are larvæ of *Allorhina nitida.* See note by C. V. Riley in Le Baron's fourth report as State Entomologist of Illinois, p. 90. See also note on the habits of these larvæ in Washington, by L. O. Howard, Canadian Entomologist, 1879, p. 200; also in American Naturalist, 1882, p. 411.

soil, but are weak and almost inactive; have a dirty-yellow color and occasional black spots. Saw no dead ones. Around margins of plat treated and in other places found the larvæ abundant and doing injury.

The lawn was not visited again until July 27. At this time I could not find Mr. Cogan, so no complete examination was made. No grubs could be found in the surface soil of the plat treated; elsewhere they were abundant, but no steps had been taken to check them.

July 31, went to the Capitol and Mr. Cogan and myself, with the assistance of a laborer, made a full examination of the plat treated. No grubs were found in the surface soil, but on spading down 8 to 12 inches some were found; further search showed them at a depth of 16 inches. Careful examination of about 3 square feet of surface to a depth of 16 inches brought to light fourteen grubs, all dead and discolored, as before mentioned. Not a living larva was found by examination on the treated plat. A spot nine paces to one side of the treated plat was examined and here grubs were found about as numerous as before, a few of which were dead and showed the same discoloration before mentioned. We then examined a spot 150 feet from the treated plat and found the grubs very numerous, some thirty being counted on 3 square feet examined. These were in no wise affected, tending to prove that those found in second place examined had crawled away from the treated plat.

This is one of the most satisfactory experiments I have ever made with kerosene emulsion. Mr. Cogan stated that he used a small portion of the emulsion diluted but eight times, and found that it did not injure the grass. However, there is no object in using it so strong, as it is easily applied, and we believe the very abundance of water helps to carry the kerosene into the soil. This was the purpose in having the ground treated so freely watered. Compared to our previous experiments for the destruction of white grubs (Bull. 13, Division Ent., 1887, p. 39) the results are similar up to a certain point, but where the earlier experiments ultimately resulted in failure we think the reason is to be found in the lack of facilities for drenching the soil. It would require a large quantity of the diluted emulsion to penetrate the soil to any depth. The emulsion was prepared according to the original formula published by this Division, and frequently repeated in Dr. Riley's official reports.

The following communication from Mr. Cogan may be taken as a thoroughly fair opinion of the success of the above experiments:

UNITED STATES CAPITOL GROUNDS,
Washington, D. C., August 2, 1888.

SIR: Early in the month of June I submitted to your Department specimens of grubs which I found destroying the grass on the lawns of the United States Capitol grounds.

Your assistant, Mr. Alwood, immediately investigated, and under his instructions the places affected were thoroughly drenched with an emulsion of kerosene in the proportion of one to sixteen, and the ground then well watered. I found that where this emulsion was used the grubs immediately ceased their depredations, penetrated

further into the ground, and not a live one was found to date after careful search, while in other places, where the emulsion was not used, they are still continuing their work in a lively manner. I have watched the experiment of destroying these grubs with a great deal of interest, for on its success or failure depended the preservation or destruction of the grass on the large lawn in front of the House of Representatives, and I have now much pleasure in stating that the experiment has been a great success.

Very truly, yours,

WM. J. COGAN,
Foreman.

Prof. C. V. RILEY.

EXTRACTS FROM CORRESPONDENCE.

A New Tomato Enemy in Georgia.

[illegible] 1888a

A year ago the accompanying Leaf-hopper was first noticed to be damaging young tomato plants. * * * I inclose you a few plants showing the nature of the damage, a single insect ruining a plant.—[A. Oemler, M. D., Wilmington Island, Ga., April 29, 1887.

REPLY.—The Leaf-hopper which you send is one which has not before been recorded as doing any such damage. It is Say's *Stictocephala festina.* Can you give us further details as to the numbers and the damage done, and their method of work, and also as to whether they appear to confine themselves to tomato plants? I can suggest nothing in the way of a remedy, except the kerosene emulsion spray.—[April 30, 1887.]

SECOND LETTER.—I inclose to you the young tomato plants to demonstrate the manner of working of the Leaf-hopper better than I could describe it. A single insect will ring the stem, when the lower stem may dwindle. The number is not great at present, still the damage is considerable on young plants, because it is not readily noticeable. It has not been seen on other plants. If you have overlooked the injury to the plants you may still observe it unless they have been thrown away. The outer bark does not seem to be eaten away, but a ring seems to have been sucked, injuring the stability, or I may say, continuity of the stem. A remedy seems inapplicable.—[May 7, 1887.]

REPLY.— * * * I have already noticed the peculiar ringing of the stem which you mention. This will be, as you say, a very difficult insect to fight, and I am at a loss at this distance to suggest a remedy. Perhaps on the ground you may be able to find one, in which case I hope you will not fail to forward an account.—[May 9, 1887.]

McNeill 1888a

Precursors of Brood V of the Periodical Cicada, 1871-1888.

On June 6 I heard the note of the *Cicada septendicem* at Port Byron Junction, 4 miles east of Moline. I have heard the note every day since in Moline. They are here in such small numbers that they have not attracted general attention. Upon reference to your report of 1885 I conclude they are precursors of Brood V.—[Jerome McNeill, Moline, Ill. June 13, 1887.

REPLY.— * * * I am glad to receive your information concerning the note of the Cicada. I agree with you that these individuals must be precursors of Brood V, as there are no recorded broods for this year. Can you not obtain a few specimens?—[June 16, 1887.]

Mites infesting an old Grain Elevator.

* * * I send you some vermin that I have been watching with interest for some time, but which I know nothing of in a scientific way. If you can tell me anything of them you will greatly oblige myself and a friend who is the unfortunate owner of the souls and bodies of millions of them. They appeared about six weeks ago, though they may have been there for some time without having been discovered, in a grain elevator (a very old building which had stood vacant for years up to last May) in a bin containing about 5,000 bushels of best lake shore wheat. They then were like fine dust, almost microscopic, white and soft. There were none of the hard, brown kind among them nor any of the long, dark headed ones. They have appeared since.

These insects are found only in this one elevator and in the one bin. They are very numerous, sifting through the wheat and the spout so that one can sweep up a quart every morning from the floor below. The wheat is freed from them by being passed through a fan before shipping. * * *.—[Howland Russel, 420 Milwaukee street, Milwaukee, Wis., September 1, 1885.

REPLY.—* * * The "vermin" which infest the grain elevator are mites (*Acarina*). There were four species sent. The one which was the original infestor and which occurs in the greatest number is *Tyroglyphus longior*. The other species all prey on this one. One of them, a species of *Gamasus*, is very abundant, while the other two species (*Cheyletus eruditua* and *Eupalus* sp) seem to be rare. The *Gamasus* will probably in a short time destroy a great majority of the *Tyroglyphi*, and thus the pest of vermin will correct itself. It will be very difficult to cleanse the elevator without emptying it pretty well. I would advise the burning of sulphur all through the building, especially where mites abound, and, where they are particularly thick, it might be well to let a little bi-sulphide of carbon evaporate, remembering that this vapor is heavier than air and that it is exceedingly inflammable. * * *.—[September 4, 1885.]

SECOND LETTER.— * * * As you say, the parasitic mites have largely destroyed the smaller ones, and I suppose when their food is all gone they will die of starvation. I do not want to trouble you further, but if you know, will you tell me whether the *Tyroglyphus* is a mite that affects the wheat alone and lives upon it exclusively, or whether it is due to the aged condition of the wood-work of the elevator, and is likely to infest anything stored there ?—[Sept. 9, 1885.]

SECOND REPLY.— * * * I am glad that the predaceous mites seem to be successful in their war of extermination, but it is not at all likely that they will permanently rid the elevator of the *Tyroglyphi*. If the wood-work of the elevator is old and there is much moisture about it, only the most radical measures will rid it of mites, now that they have established such a foot-hold. The contents should be removed as far as possible and the building thoroughly dried, and it should also be fumigated as I suggested in my last. It should be repainted if possible, and all dirt and trash cleaned up. This course will be expensive, and it is for the owner to decide whether it will pay him to go to this trouble; but as I said before, it will be the only complete and satisfactory way. *T. longior* feeds on flour, hams, cheese, and a variety of other food products.—[Sept. 12, 1885.]

The Streaked Cottonwood Leaf-beetle in the East.

I send to you by mail to-day a box containing a beetle and larvæ which, we find, as a nuisance, is a fair rival to the potato-bug.

It gets on the young leaves and shoots of the Carolina Poplar, eating the leaves entirely off, and oftentimes destroying the bud on the end of the branches.

We first noticed it about three years ago, but as there were so few of them we did not take pains to destroy them, but they have been getting worse every year, until

now we are afraid they will do too much damage, and we are at work putting Paris green on the trees to see if that will kill them. * * * They are also spreading to the willows, and also to the young Kilmarnock willows and New American.—[Thomas B. Meehan, Germantown, Pa., July 6, 1887.

REPLY.— * * * The insect which you find on the leaves and shoots of your Carolina poplars is the common Streaked Cottonwood Leaf-beetle (*Lina scripta*). This insect was described by Professor Riley in his Annual Report for 1884, on pages 336 to 340. The article was suggested by the great damage done by this insect in the newly-planted timber claims of the Northwestern Territories during the summer of 1884. The question of remedies is discussed in this article also.—[July 8, 1887.

Hibernation of Mosquitoes.

[The following letter was the second from Mr. Wade on this subject. His first letter mentioned incidentally that mosquitoes wintered in large numbers in his cellar, and the following is in reply to our request for specimens.]

I tried to catch some of the mosquitoes by day-light, but they were too wide-awake; so I let it go until this evening, when I tried to catch and box them alive, but it seemed as though two flew out every time I put one in. I have got a few for you, probably enough; if not, I will try again. The cellar is very cold, and yet in one corner is a tin furnace conductor of heat. It seems as though they avoid the warm corner, as they were thickest all the time in the coldest part of the cellar. They seem nearly as lively as in the summer, and I notice they are paler in color than those outside in the open air. A few weeks ago they were so thick (in this cellar, of course), that my housekeeper would hold the lamp up to them, and in a very short time the inside of the chimney would be a half-inch deep or more. I gave John Butterworth, an English microscopist, now travelling here, a small bottle full of them to take home. To-day, though cold, I could look out of any of my windows and see them flying as in summer. It is many weeks since any of us were bit. I have never known them so bad anywhere as they were here the past summer, and yet it is high, dry, rocky ground.—[Jos. M. Wade, 158 Federal street, Boston, Mass., Nov. 16, 1884.

REPLY.—I have carefully examined the mosquitoes you sent with your favor of the 16th instant, and I find them in no way different from one of our common and widely-distributed species which is supposed to be the *Culex ciliatus* of Fabricius. You are no doubt aware that, so far as we know, our northern mosquitoes pass the winter in the imago state and that, like most other insects, they choose places of a uniform and pretty low temperature. Thus they pass the winter in a semi-torpid condition without taking food, whereas in a warmer place they would be kept alive and perish for want of nourishment.

The fact that you found such immense numbers of mosquitoes in your cellar shows that they must have been unusually numerous with you the last season, and further that your cellar must have been particularly attractive to them as a suitable place for hibernation. Still, upon careful inspection of the locality in question, it ought not to be difficult to ascertain the reason for this remarkable gathering of mosquitoes as related by you.—[November 24, 1884.]

Leaf Hoppers and the "Die-back" of the Orange.

On yesterday I sent you by mail a bug, like inclosed, asking that I might be informed of its name and habits. To-day I send two more with samples of orange twigs in the grove where these bugs are in considerable numbers. I can't, for a fact, say the bugs are the cause of die-back, but certainly the presumption is great. They are constantly on the trees in considerable numbers; they do not seek roots or trees with scale on or any form of insect or fungus. They are on the new twigs or the growth prior to the last, and, as you will observe, the damage is to those parts of the

tree. The trees chiefly affected are set in grove budded last fall, dormant and cut off this spring. They have made a beautiful growth; are thrifty, clean, free from insects of every kind. The theory of soil-poisoning is hard to accept for the reason that every tree is not affected nd some older trees are not affected—only now and then one with here and there a twig—also the fact that the disease occurs in widely separated parts of the grove; and this morning I found one or two young trees in my nursery and some two or three trees in an entirely different part of the 40-acre property. Chiefly it occurs in places where cow-peas are growing, though the nursery is of course clean, but wherever the disease does occur these bugs are found. The habits of the bug, so far as the orange tree is concerned, are as follows: Usually they are in company, two or more; they rest on the twig, close to it, without motion for a long time. I stood watching six of them this morning for thirty minutes; they did not move until I disturbed them, but they protruded the termination of the abdomen beyond the wings and ejected with considerable force towards me minute drops of fluid in a continuous spray, an astounding amount of fluid for so small a bug. It wet the leaf that I inclose so that it ran down in a stream to the center and then dried on. I disturbed them, however, and could see no marks of any injury done by them. I found two "Green Soldier Bugs" and two or three "Leaf-legged Bugs," but surely that is nothing to an amount of damage being done. * * * —[C. F. A. Bielby, De Land, Fla., August 1, 1887.

REPLY.— * * * The insect in question is one of the Leaf-hoppers and seems to be a new species of the genus *Aulacizes*. Nothing definite can be said as to the work of the insect; that is a point which you will have to determine by observation in your grove. It is quite possible that they do a certain proportion of the damage, in which case the ordinary kerosene emulsion spray, applied for Bark-lice, will doubtless rid your trees of these also. Certainly the twigs sent by you through the editor of the Florida Dispatch were affected by the so-called "die-back" disease which has been frequently treated in the columns of the Dispatch, and which is mentioned by Mr. Hubbard in his Report on Insects affecting the Orange, and of which you doubtless have a copy.

Your observation to the effect that the *Aulacizes* occurs chiefly in places where cow-peas are growing may be an important one. Is the bug found upon the cow-peas also? The liquid ejected from the bug which you watched is of a saccharine nature, like honey-dew. Allied species are well know to eject this fluid with considerable force. The *Proconia*, which is found upon cotton-plants, is remarkable for the distance to which it ejects drops of the liquid. * * * —[August 6, 1887.]

SECOND LETTER.—In accordance with your request for additional specimens of the bug described by you as a new species of the genus *Aulacizes* I herewith send you tin box containing several of different ages and stages of development. I don't know how many there are in the box, as I caught them this morning with considerable difficulty.

There was a strong northeast, damp wind blowing, and whether that made them more lively or myself less so I am unable to say; they are quick in motion, strong in flight, and very wary. I have discovered the young down to a very minute size, but I can not as yet say as to their eggs, what they are like, or when deposited. I have not seen them on the cow-pea, but my observation leads me to think they are more numerous when this crop is grown in the grove. I judge from the yellow contents of the food-sac that they suck the essential oil from the twig. Would this affect the twig seriously? They choose a position head downward on a twig, not the nearest, but half (or less) hardened. When they are comfortably settled they straighten out the sucking tube, which, as you know, is short, then with their feet draw themselves down, with one motion, forcing the tube into the twig; they then remain perfectly passive. Whether they eject the fluid when not disturbed or not I can't say; but when I came near to them, not disturbing them, they ejected it in my direction; it is colorless, and leaves, on drying, a whitish deposit on the leaf (I send you herewith two leaves); it

may be "honey-dew," but it does not attract, so far as I have seen, ants or other in sects that are wont to gather to this sort of feast.

As to the result to the trees, the twigs I sent to the editor of the Florida Dispatch certainly had the "die-back;" that goes without saying, for they died back. I would like very much to connect this new marauder with the trouble, if possible. There is only one objection, or rather difficulty, but that seems almost insurmountable. I see the bug on plenty of twigs that do not die back, that absolutely decline to be in the least affected. I console myself with the reflection that they have oil to spare.

As a rule, however, the twigs do not die back unless they are very young; they blister and do not look well, but continue to harden and send out, some of them, new and healthy-looking shoots; others send out weak shoots that are sometimes themselves affected, *sometimes not*, usually the twig reddens a little, but not always. There is on reasonable hypothesis upon which to base the trouble except insects. I sunk a shaft 10 feet in the ground between four affected trees. Two feet of gray sand (first class), then 8 feet of yellow sand. After 6 feet down there were three or four thin strata of red sand, one-fourth to one-half inch in thickness. At 10 feet struck water. Drove a rod down 9 feet further and found no hard pan. The soil is of the best pine land. The original growth was very large, soft pine trees and willow oak as large as my body (and that is good size).

As to other bugs, there are a few leaf-footed bugs; also a few *Euthoctha galeator;* these I have never seen doing any great damage. There are a great many of the Green Soldier Bugs. I don't see them doing much sucking at twigs, though I have seen some. But the trouble in my grove seems to be the same or nearly so as that described by Mr. James Franklin (Hubbard, page 160). In conclusion, permit me to say that the same twig blistering and dying is not confined to my grove; I find it in quite a number of groves, but in none so general as my own. In not less than four or five young groves, in different places, there are the new bugs, and there also are the diseased twigs. So also in groves where the twigs are not diseased, the bugs occur; and in groves where are both twigs and bugs, some trees have every twig affected and other trees have no signs. So what would be a clincher against the bugs is really turned to our confusion.—[August 10, 1887.]

SECOND REPLY. * * * The specimens which you sent comprise not only the new species of Aulacizes which accompanied your previous letter, but two specimens of *Proconia undata*, a closely allied species, and also a number of young of one or the other. * * * It will be impossible to connect either of these leaf-hoppers or any of the Soldier Bugs with the diseased condition of your trees. Their punctures, of course, help to weaken the vitality of the trees, but that they are the cause of the "Die back," is hardly possible. You have doubtless read what Mr. Hubbard says in his report on orange insects concerning the "Die back," and this comprises the extent of our present knowledge of this trouble.

The mycologist of the Department is making studies of the fungi connected with the disease of the orange, and it is possible that some practical results may be obtained through his investigations. For the present we can only recommend the dilute carbolic or creosote washes. A few more specimens of the Aulacizes will be acceptable, and you might, if you feel so inclined, send on a few specimens of the insect which you know as the "Green Soldier Bug."—[August 16, 1887.]

The Barnacle Scale Injuring Persimmon.

You will find inclosed two twigs cut from a persimmon covered with what I suppose to be a kind of scale. I have seen now and then one on an orange tree, and have always destroyed them for fear that it might be the Fluted Scale (*Icerya purchasi*). This persimmon tree was covered with them, and I burned it up. It is the first time I have seen them in any numbers. * * * [W. A. Marsh, Orlando, Orange County, Fla., August 15, 1887.

Reply.—The insect upon the twigs is the common Barnacle Scale of Florida. (*Ceroplastes cirripediformis* Comst.) It is figured and described in the Annual Report of this Department for 1880, and in Hubbard's Report on Insects Affecting the Orange. Its occurrence upon Persimmon has, I believe, never been publicly noticed. It is usually found upon the species of *Eupatorium*, and occasionally upon Orange and Quince. It is not a very common insect, but if it should become numerous enough to threaten damage, it can be killed while young, before the wax is hard, by the application of the ordinary kerosene emulsion.—[August 19, 1887.]

Euryomia Melancholica vs. Cotton Bolls.

I send you by this mail a small box containing a specimen of damaged cotton-boll and the bug which my correspondent thinks is the culprit. It comes from Mr. C. H. Estes, Talbotton, Ga., who writes me that he took them from the farm of his neighbor, Mr. H. C. Greene, and that as many as 39 bolls similar to the one sent were taken from one stalk of cotton. I have written to Mr. Estes, expressing doubts about the truth of his theory. It does not appear to me that the injury was done by the beetle. However, I know but little about such things, and know that new insect depredations are being developed constantly. Please give me your views or the history of the bug.—[J. T. Henderson, Atlanta, Ga., August 21, 1885.

Reply. * * * The insect is a beetle which is very common throughout the South. It has been called the Melancholy Euryomia (*Euryomia melancholica*). It is a very general feeder, and occasionally damages peaches and other fruit, but seems to prefer such fruit as is rotting and has been previously gnawed into by some other insect. It is also found clustering about bruised and cut places in the trunks of trees from which the sap is exuding. Your surmise was therefore correct, and an examination of the boll sent seems to indicate prior damage by the boll-worm.—[August 26, 1885.]

A Peach Fruit-worm in Japan.

During my stay in Japan as naturalist of the United States Eclipse Expedition my attention has been attracted to the general prevalence of disease among fruit trees of a deciduous growth, due for the most part to the ravages of insects. My attention has been especially attracted to the fact that the peach crop is rendered an almost complete failure, so far at least as the quality of the fruit is concerned, by the attacks of a small lepidopterous larva which bores the fruit, causes it to decay, prevents its coming to a sound maturity and ripening in a marketable condition. In consequence of this liability to insect attacks, the custom prevails almost universally, as you are well aware, of taking the fruit from the trees while yet green and hard and thus exposing it for sale and consumption.

I desire to suggest, inasmuch as large exports of trees and plants to the United States are constantly taking place from the Japanese ports, that wise precautions should be adopted to prevent the accidental introduction into the United States of this pernicious insect, which so far as I know has not yet made its appearance upon our soil. While it is barely possible that the climatic condition in the United States might prove unfavorable to its development and propagation, this is altogether unlikely. There should be, in my judgment, steps taken to absolutely prohibit the transportation to the United States of Japanese peach trees, or of trees and plants which have been grown or packed in soil taken from the vicinity of peach trees and peach orchards, inasmuch as the larva of this insect undoubtedly pupates in the soil or upon its surface. For the sake of the farmers and fruit-growers of Japan I would like to suggest that if no entomologist has hitherto worked out the life history of this insect and ascertained the best means of combating its attacks, it would be desirable that the Japanese department of agriculture should take the matter into hand and have the work done. I would like to suggest as a useful precaution the destruction of all badly in-

fected trees, especially seedlings growing by the wayside and in waste places, and the careful collection of all wind-fallen and diseased fruit and its destruction by fire. The consumption of fruit in an unripe condition can not be otherwise than prejudicial to the general health of the community, especially in seasons when cholera and like diseases are prevalent, and the financial loss to the agriculturist must be immense when we bear in min! that the ravages of the codling-moth which attacks the apple in the United States are estimated to annually occasion a loss to the fruit-growers of the Union of from $4,000,000 to $5,000,000; the importance of checking the attacks of a similar insect infesting the peach in Japan must commend itself to your mind. Our own Department of Agriculture at Washington has labored long and laboriously to instruct the fruit-growers of the United States as to the best and most effective means of guarding against the ravages of such insects, and it can not but feel that the Japanese authorities have a work to do here which, if accomplished, would be a great benefit to their farming community.—[W. G. Hall, Ph. D., naturalist, United States Eclipse Expedition to Japan, Tokio, Japan, September 15, 1887.

[The above letter was written by Dr. Hall to Hon. R. B. Hubbard, United States minister to Japan, and by the latter was referred to this Department through the Department of State. Commissioner Colman's reply follows. We have since received no further information on the subject.]

I have the honor to acknowledge the receipt of your letter of the 26th instant, inclosing Dispatch No. 379 from Mr. Richard B. Hubbard, United States minister at Tokio, which is accompanied in turn by a letter from Mr. W. J. Holland, the naturalist of the United States Eclipse Expedition to Japan. The matter has been referred to the acting entomologist of this Department, who reports that the subject is one of considerable interest, but that its full weight can not be determined without a more accurate idea of the nature of the insect in question. If it should prove to be one of the insects which already infests the peach in the United States any regulations to prevent importation will of course be unnecessary. It is desirable, therefore, that some entomologist in Japan should investigate the matter and determine accurately and specifically the identity of the pest in question. Prof. C. Sasaki, of the Agricultural and Dendrological College, Tokio, Japan, is a very competent individual, who has made his name well known by his investigations of the Uji parasite of the silkworm of commerce.

If your Department will kindly forward this letter to Mr. Hubbard, with the request that he will forward it to Professor Sasaki, requesting him to correspond direct with this Department, we shall be able to get to the bottom of the matter in the shortest possible time. Mr. Holland himself should also be requested to rear the insect and send it in all its stages to this Department.

Hibernation of the Two-spotted Lady-bird.

I have observed some little matters the past three winters in my present house that may or may not interest you. During those winters there has seldom been more than two or three days passed that I have not had "lady-bugs" creeping and flying about my house. My library is never warmed except in the evenings, but when the room got warm they would invariably come out and be active all the evening, seldom more than one or two at a time, but they have shown themselves continually every few days during that time. At one time during cold weather there were probably 1,000 on the inside of my front door. I have fed them milk, beer, water, and made one drunk on gin; yes, it was actually drunk and showed it; they drink readily; after being about my desk for a few days.—[Jos. M. Wade, Boston, Mass., March 31, 1885.

REPLY.—* * * The species you refer to is no doubt the Two-spotted Lady-bird (*Coccinella bipunctata* Linn.), and as an interesting point in the natural history of this species I would state that of the many species of Lady-birds so abundant in summer-time almost everywhere, this is the only one which has accustomed itself to

seek winter quarters in our houses. Of course specimens may also be found occasionally hibernating under bark or other suitable places out-doors. * * *—[April 3, 1885.]

Prior Issuing of the Male Sex of Cimbex.

* * * Let me add that I was greatly interested in your account of *Cimbex americana.* Some seven or eight years ago I had about a pint of the cocoons, obtained from between the roots of the weeping willow above ground and among the leaves on the ground. There were more there; I raised them. Think I got nearly 200 imagos, and was surprised that, with the exception of two or three individuals, the first 80 that came out were males. I used a large empty aquarium for the hatchery, and the show made was fine.—[Sam'l Lockwood, Freehold, N. J., March 31, 1885.

Work of the Bronzy Cut-worm in Missouri.

I mail you, simultaneously with this, box containing the larva of some insect (probably) that has at this date denuded the Timothy grass of its seed, holds it like a coon in its fore feet while it eats and then drops the empty shell. It has now stripped nearly every head in our extensive meadows. I find this morning a small, quick-flying miller in the grass which I can not catch and do not know as it is related to these worms. Please determine its species and give us its life-history if you can.—[A. D. Thomas, Terre Haute, Palmyra County, Mo., June 24, 1887.

REPLY.— * * * The worms which you sent belong to the species known commonly as the Bronzy Cut-worm (*Nephelodes violans*). This is a species which has seldom been recorded as doing much damage. It was noticed by Professor Riley in 1871 in Missouri, and in 1881 it did considerable damage in northern New York. It is a very widespread species, and is found in all of the United States east of the Rocky Mountains. The worm does most of its damage in May and June, and enters the ground to transform to pupa towards the middle or the latter part of June. It remains in this condition until autumn, when the moth makes its appearance. Where a field has been badly damaged it will be a good plan to plow it over in July or August and expose the pupa to the heat of the sun and to flocks of chickens and turkeys. This is the only remedy which is like to prove efficacious.—[July 19, 1887.]

The Bamboo Sinoxylon.

Inclosed in glass bottle you will find some curious beetles which were found boring into and apparently living upon an ornamental bamboo box placed on a table in one of the rooms; no indication of their presence was noticed until on lifting the lid the fine powder from their borings was seen, and on a slight shake numbers of the creatures were dislodged and moving about quickly. Under a magnifying glass their curious figures are quite interesting to watch. Any information you may see fit to forward will be awaited with interest.—[A. L. Townsend, box 246, New York, N. Y., January 8, 1888.

REPLY.—Your letter of the 8th instant, inclosing speeimens of insects found boring into an ornamental bamboo box, has been duly received. The insect in question is one of the wood-boring beetles of the genus *Sinoxylon* and belongs to a species which, although undetermined is frequently found in bamboo canes and boxes from China and East India. It is closely allied to a species found in Florida and it has similar habits. These insects are slow of development and indeed may remain in a state of retarded development for a number of years. If you wish to completely disinfect your box you can do so by pouring upon it a little bisulphide of carbon.—[January 16, 1888.]

The Western Cricket in 1887.

I hear that "grasshopper locusts" have been very destructive this year in the Greenhorn district, on the border of Pueblo and Huergano Counties, but I have not

been able to visit the district or obtain any specimens of the destructive species. I expect, however, that they are the *Camnula pellucida* (*C. atrox*), as this species appears to be abundant this year in Colorado. I found it particularly abundant at the head of the Arkansas River, in Fremont Pass, and also in the streets of Leadville, both these localities being on the eastern slope.--[Theo. D. A. Cockerell, West Cliff, Custer County, Colo., December 1, 1887.

[See Second Report U. S. Entomological Commission.]

Dicerca a Poplar-feeder.

A few weeks ago I discovered a Coleopterous larva, 15½ millimeters long, boring into a *Populus tremuloides* tree. I put it into spirits for future investigation, and thought no more about it until I came across the figure of larva of *Dicerca divaricata* (Third Report U. S. Ent. Com., Pl. VI, Fig. 2), and noticing the resemblance to my larva, took out the latter for comparison. There can be *no doubt*, I think, that my larva is a *Dicerca*—probably *D. prolongata* Lec. (vide former letter), thus fully confirming this as a poplar (and not pine) feeder, and establishing it as a decidedly injurious insect. To me personally, however, it is a beneficial insect, since it kills just enough trees in this neighborhood to keep me supplied with dry fire-wood.—[T. D. A. Cockerell, West Cliff, Colo., December 27, 1887.

An Enemy to Young Carp.

I inclose two insects—No. 1, the larger, sent to me by a gentleman who states that it fastens on the carp fish and finally kills it. * * *—[W. L. Jones, Atlanta, Ga., October 3, 1884.

Reply.— * * * The specimen, No. 1, which is reported to have attacked and killed a carp, is the larva of one of our common Dragon Flies or Mosquito Hawks (Family Libellulidæ, Order Neuroptera), the species having been described as *Anax junius* These larvæ are aquatic, and feed upon all sorts of soft-bodied water insects they can get hold of. They are also known to attack young fish, but this is a rare occurrence, since the larvæ are slow-moving animals and by no means able to pursue a fish.-- [October 7, 1884.]

NOTES.

THE TWELVE-SPOTTED DIABROTICA INJURING FRUIT TREES.

A new habit of this destructive species was brought to our attention the present spring. Mr. J. Luther Bowers, who resides at Herndon, Va., has a young orchard consisting of trees planted for the most part in the spring of 1887. The neighboring fields are partly cultivated and partly grass lands, with no forests near. Most of the field in which the orchard stands was in corn last year and is entirely so planted this year. Last year, however, there was a half acre of melons on the south side. The trees made a fine growth last year and are now vigorous and promising except where the leaves have been eaten. The orchard consists of rather more than 2,500 trees, of which 760 are plums, and the rest are peach, pear, cherry, apple, and apricot. The varieties are mingled together, the apples, however, being set out to form a permanent orchard. In the latter part of April and the first of May, when the leaves were putting forth, Mr. Bowers observed the beetles of the Twelve-

spotted Diabrotica eating the leaves. The plums and the apricots were selected out by the beetles, and except in a few instances nothing else was touched. The exceptions were the Governor Wood Cherry and the Hansell Raspberry, which were slightly injured. The attack began upon trees planted in the old melon patch above mentioned. The plums and apricots in the immediate neighborhood were soon stripped of foliage, and the insects spread over nearly the entire orchard. The first and second growth of leaves were almost entirely devoured and the third growth was much injured. Many of the trees partly succumbed to the attack and some were killed entirely. The injury was quite severe and amounted to several hundred dollars. The injury was not entirely due to the Diabrotica, although Mr. Bowers, who is a very good observer, states that this insect was by far the most numerous of any of the species found upon his trees. The well-known weevil—*Epicærus imbricatus*—occurred in small numbers and attacked the foliage to some slight extent, and one of the common May beetles—probably *Lachnosterna fusca*—was also present on some few evenings in still smaller numbers. Another Scarabæid (*Diplotaxis* sp.) was also noticed. There seems, however, no doubt but that the main damage was done by the Diabrotica, and this instance is certainly the most marked which has ever been brought to our attention of damage done to fruit-trees by this species. It is safe to say, however, that this occurrence is exceptional, and that it depended almost entirely upon the peculiar circumstance of a young orchard having been planted close to a last year's melon patch, which was not replanted this year. The beetles undoubtedly bred upon the melons last season and hibernated in large numbers. The present spring, finding no more appropriate food at hand they took to the young plums and apricots merely as a substitute. We have little fear, therefore, that a new habit has been formed.

The above facts are gathered from correspondence with Mr. Bowers and from observations made by Mr. Alwood, who visited Herndon at our direction on the evening of June 13th.

HEAT EVOLVED FROM THE WORK OF A BRUCHUS.

In June, 1887, Judge Lawrence Johnson, of the U. S. Geological Survey, a member of the Entomological Society of Washington, sent to the Division from Holly Springs, Miss., a small quantity of Cow Peas (*Dolichos* spp.), which were badly infected by *Bruchus scutellaris*, and in his accompanying note mentioned a circumstance which is worthy of record, as we do not recollect to have seen anything similar in print. The peas when he first examined them were contained in a paper sack, which would hold about one gallon, and which was about one-third full. Resting the bottom of the sack accidentally upon his hand he noticed that it was very perceptibly warm. He then tested its heat with an ordinary thermometer and found that while the temperature of the air was

only 71° Fahr., the mercury rose when placed among the peas to 96° Fahr., a difference of 25° "in a few minutes."

This difference in temperature was evidently due in great part to a mechanical cause, the gnawing of the peas by the beetles and larvæ, for subsequent tests have shown that the difference in temperature between uninfested peas in mass and the surrounding air in summer is slight, varying with the time of day, the peas being cooler than the air at midday and warmer after sundown. No opportunity has since offered for testing the temperature of the weevils alone in mass, although such comparative tests would be interesting.—L. O. H.

ECONOMIC ENTOMOLOGY IN INDIA.

We are indebted to Mr. E. C. Cotes, first assistant to the director of the Indian Museum at Calcutta, for copies of his first and second papers upon economic entomology. No. 1 is devoted to a preliminary account of the wheat and rice weevil in India, and No. 2 considers the experimental introduction of insecticides into India, with a short account of modern insecticides and methods of applying them. Of the latter we need not say anything, except that it is a short summary of a few of the remedies now in use in this country. The first, however, is of considerable interest as a consideration of the cosmopolitan *Calandra oryzæ* in a more or less tropical country in which the principal industries are wheat and rice. Mr. Cotes has gone over the ground of previous publications very carefully and introduces a great deal of interesting correspondence. Nothing new in the way of remedies is suggested and no particular experiments have apparently been made. The point in his paper which interests us most is the statement of the loss which is brought about. He says: "The amount of loss occasioned by the weevil is estimated by Messrs. Ralli Brothers at an average of 2½ per cent., the maximum being 5 per cent. and the minimum 1 per cent. Taking the value of the wheat exported at £6,000,000, the annual loss occasioned by the weevil in exported wheat alone is £150,000. This sum, however, in reality represents but a fraction of the whole loss, as it does not take into account the damage done to wheat consumed in the country or any of the loss occasioned to the rice, which is also attacked by the same weevil, besides the loss indirectly occasioned owing to the difficulty of storing the grain." The species seems to be two-brooded in India, the beetles appearing in June and January.

BUFFALO-GNATS ATTACKING MAN.

In our report for 1886 we devoted a paragraph to the consideration of several cases of loss of human life from the bites of Buffalo-gnats, but our agents who have visited the region where these insects abound find that rumors of such cases are hard to trace and that the newspaper reports are seldom authentic. All of the agents employed on this investigation have been asked to verify if possible any such accounts, and

the following quotation is from a letter received by Mr. Webster in reply to inquiries which he had made:

"I had a nephew by the name of L. H. Stokes; I suppose he was thirty-five or forty years old and a man of family. He lived near the Hatchie River—I think it was near Hening Station; the year I have forgotten, but think it was about 5 or 6 years since. It seems from what I could learn that Stokes, in company with a party, went fishing and crossed over onto an island. The gnats were bad, and the party kept leaving. All were scattered on the island. Finally, in leaving, it seems they left my nephew over there. It rained and put out the fire (it was cold and the smoke was some protection from the gnats); he had no matches, so he went to where they left the boat, and found his company had all gone and taken away the boat. He could not swim, so he was left to the mercy of the gnats. He fought till near night before he could make any one hear him. After they came and took him over he went home and suffered considerably, and before day he died. I never learned the doctor's name, as my sister objected to the marriage of her son, which caused a coolness, so he moved off, and we did not know it until several days after his death. This is all I can tell you about it. There is no doubt but that the Buffalo-gnats killed him. I learn that he was very much swollen. He has a brother living near Chestnut Bluff named Clinton Stokes, but I do not think he could give you any information. You ask what part of the body was bitten. I can not tell this, but think it was his hands, arms, face, neck, etc.—A. E. Buck.

NEW EUROPEAN NATURAL ENEMIES OF THE ASPARAGUS BEETLE.

H. Lucas, in the Annales de la Société Entomologique de France, 1st part for 1888, just published, announces that he has discovered two new natural enemies of *Crioceris asparagi* in the vicinity of Huppain. One is the Heteropter *Calocoris chenopodii*, which he discovered in the act of sucking a larva, while the other is of much more importance and is nothing less than an internal Tachinid parasite, viz, *Myobia pumila*. This species has long been known in Europe and was first described by Macquart in 1854. Mr. Lucas observed these flies abundantly throughout the asparagus beds, but did not suspect that they were parasites of the larva of the Asparagus Beetle. While searching, however, for the pupa of the *Crioceris* he found in the earth under the young plants a large number of larval skins, which had near the head, and sometimes also at the other end of the body, large openings. He took a dozen full-grown larvæ and placed them in a box (this was in July, 1887), and upon his return to Paris, about the middle of August, he found that several of the Tachinid flies had emerged, having undergone their transformation to pupa and to fly within the skin of the *Crioceris* larvæ. From observations which he made it seems that the fly frequently emerges from the larva before the latter has descended to the ground.

No one seems to have noticed this habit of the *Myobia* before, and, judging from Mr. Lucas's experience, it seems to have been so common in the locality where he observed it as to be an important factor in regulating the numbers of the Asparagus Beetle. Up to the present time not a single natural enemy of this insect has been discovered in America, although it is annually doing a great deal of damage from Long Island to Virginia and for some little distance inland. It ought not to be a difficult thing at the proper season of the year to import this parasite from France, and we shall be greatly pleased if our friend, M. Lucas, will assist us by sending material. No species of *Myobia* are now known in this country.

CONCERNING THE UJI PARASITE OF THE SILK-WORM.

Prof. C. Sasaki's admirable paper upon the biology of the celebrated silk-worm parasite of Japan has already been noticed in this country in a recent number of the American Naturalist, and hence does not require further notice here. We may state, however, that we have received specimens of the parasite from Professor Sasaki direct. Our object in mentioning the paper at this time is to call attention to the fact that Mr. J. M. F. Bigot, in the *Annales* for 1888 (Bulletin, page XXXIX) states that after a careful examination of the plate he has is decidedly of the opinion that Rondani's provisional erection of the genus *Ujimyia* for this species was unnecessary and that it really is nothing but a species of the Tachinid genus *Leskia* of Robineau-Desvoidy (1830). Mr. Bigot's determination of this fact is extremely interesting because from his standing as a dipterologist there can be but little doubt as to the accuracy of this conclusion and principally because there are two European species of the genus *Leskia*, viz, *L. aurea* and *L. bicolor*, and there will therefore be opportunity in Europe to verify the abnormal point in the life history of the Uji fly brought out by Mr. Sasaki, which is to the effect that the eggs are not laid upon the silk-worms, as is the custom with other Tachinids, but are laid upon the mulberry leaves and are hatched after they have been eaten by the silk-worms. We are not aware whether the habits of the European species are known, but if they are at all common it ought to be not a difficult matter to ascertain their habits and to compare them with those of *Leskia sericaria*, as the Uji fly must now be called.

Our faith in the unity of habit in the same family would make us somewhat skeptical of the accuracy of Sasaki's observations, notwithstanding the high character of the work as a whole.

PERSONNEL OF THOSE ENGAGED IN GOVERNMENT ENTOMOLOGICAL WORK.

The following list embraces those now engaged in Government entomological work, and who will assist in the management of the periodical, those at Washington editorially, and the others as contributors. The force of the Division of Entomology is more or less inconstant, as it consists of both permanent and temporary employés:

IVISION OF ENTOMOLOGY, U. S. DEPARTMENT OF AGRICULTURE.

Entomologist: C. V. Riley.
Office staff: L. O. Howard, First Assistant; E. A. Schwarz, Th. Pergande, Tyler Townsend, W. B. Alwood, Assistants; Philip Walker, Assistant in silk-culture and in charge of reeling experiments.
Field Agents: Saml. Henshaw, Boston, Mass.; F. M. Webster, Lafayette, Ind.; Herbert Osborn, Ames, Iowa; N. W. McLain, Hinsdale, Ill.; Mary E. Murtfeldt, Kirkwood, Mo.; Lawrence Bruner, West Point, Nebr.; D. W. Coquillett, Los Angeles, Cal.; Albert Koebele, Alameda, Cal.

DEPARTMENT OF INSECTS, U. S. NATIONAL MUSEUM.

Honorary curator: C. V. Riley.
Assistant curator: John B. Smith.

☞For bibliographical purposes it may be necessary to state that, where expedient, the names or initials of members of the force will be attached to their communications. Where initials alone are appended, the full name can be ascertained by referring to the list above.

Editorial or unsigned articles or notes should be accredited to "Insect Life," or, where it is desired to give personal credit, to "Riley and Howard." While most of the correspondence of the Division is carried on by myself, yet much of it is also attended to by my first assistant, Mr. Howard, who acts as Entomologist in charge during my absence, and otherwise so materially assists in editorial and office work that only those articles signed by either should be considered individual.—C. V. R.

U. S. DEPARTMENT OF AGRICULTURE.

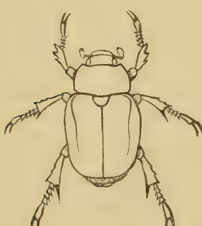
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. SEPTEMBER, 1888.

Vol. I. No. 3.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS, WITH THE SANCTION OF THE COMMISSIONER OF AGRICULTURE.



WASHINGTON:
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1888.

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Outlook for Locust or Grasshopper Injury.—One of the most important results of the Rocky Mountain Locust investigation by the U. S Entomological Commission is that, by visiting the chief breeding-grounds of the insect and noting the state of affairs there, it is possible to predict in advance, with a high degree of probability, whether or not there is any danger of extensive injury the ensuing year in the temporary region, or country occasionally invaded. Fully recognizing the economic importance of this, we have, since our connection with this Department, endeavored to have such observations made, whenever practicable, as would give us the required knowledge; and it is gratifying to know that the conclusions which we have hitherto ventured to draw from the reports have been so far uniformly justified by subsequent experience. Mr. Lawrence Bruner has just returned from a visit to northwestern Nebraska, southwestern Dakota, and central Wyoming, and has sent us a brief report of the results, which will be found in this number. It is with great pleasure, therefore, that we announce that, so far as this examination warrants an opinion, the outlook for the coming year is most favorable. We are all the more pleased to make this announcement because, from the accounts in the Ottertail region of Minnesota earlier in the season, and the excessive drought that has prevailed for two or three years in some portions of the West and Northwest, we had fears of serious injury in the near future.

While, therefore, the work of Mr. Lugger in Minnesota, and that of Mr. Bruner in other parts of the Northwest, show favorably for the immediate future, very considerable injury has been done by sedentary or non-migratory species in some parts of the country the present year. An account of very serious damage in Michigan from *Caloptenus bivittatus* and *C. femur-rubrum* appears in the "Extracts from Correspondence" in the present number.

We are much gratified at the manner in which "Insect Life" has been received, and with the many assurances from working entomologists of sympathy and support. We shall be glad to publish, from any

source, original contributions to knowledge of insect life, or communications that will in any way advance economic entomology. A prominent author and naturalist, and one deeply interested in the habits of insects, so nearly expresses our intentions and wishes in a recent letter that we quote the following passage therefrom:

May I be permitted also to express my gratification at the action of the Agricultural Bureau in making this new departure. In my judgment it is a highly important and valuable addition to the study of economical entomology, and indirectly will tend to stimulate all investigations into the habits of our insect fauna. I sincerely trust that this monthly bulletin will be a prominent feature of your Division, and that it will assume a broader character as it develops and become a national organ of all who are working in the field which it covers; that it will represent us before the entomologists of Europe, and will thus become what we have so long needed, a vehicle of communication between the more scientific workers and students and the masses of intelligent people, as well as an organ of interchange of facts and theories between entomologists themselves.

Importation of Insect Parasites.—It is rarely that such an excellent opportunity offers for practically exemplifying the benefit that may accrue from the artificial introduction of parasites of introduced insects that are injurious to agriculture as has lately been afforded by the history of that most destructive of Californian pests the Fluted Scale (*Icerya purchasi*). At our request and through the kind efforts of Mr. Frazer S. Crawford, of Adelaide, South Australia, the Dipterous parasite, described by Dr. Williston on page 21 of this journal, has been successfully introduced, but with what final results we shall indicate later on. The subject is, however, so important that we have long wished to have a thorough study made of the parasites of the Icerya in Australia, with a view to a systematic effort to introduce them alive. The Commissioner of Agriculture appealed to Congress for authorization to send an agent to Australia for such purpose, but without avail, as there has for some years been a clause in the bill appropriating for several of the divisions of the Department which confines investigations within the limits of the United States. We are glad to announce, however, that through the public spirit of the commissioners to the Melbourne Exposition, and of the Secretary of State, the Commissioner of Agriculture has been able to send an agent, and Mr. Albert Koebele sailed on the 23d of August under our instructions, from which we quote the following:

As you have already been informed, your mission to Australia is for the purpose of making an investigation of the parasites of *Icerya purchasi*, with a view of introducing them into California. It will be necessary for you to go to Adelaide to see Mr. Frazer S. Crawford, who sent the Dipterous parasites and the *Calostomas* (or rather *Monophlæbus crawfordi*) to Mr. Klee and Mr. Coquillett at my request. This Dipterous parasite has been named by Dr. Williston *Lestophonus iceryæ*, and at Adelaide you will probably be able to study this insect carefully. Make the most careful investigations wherever you can learn of the occurrence of *Icerya*, and find as many of its natural enemies in Australia as possible. Find out also the periods at which these parasites oviposit, and ascertain the season at which success in importation will be

most likely with each and all of them. Once on the ground you can see for yourself just what will be necessary to be done in order to bring about this result. You should also endeavor to place the Department in correspondence with as many observers as you can interest in the subject, and should by all means endeavor to get at least one person who will be able to devote some time to the matter and to continue observations after you return. You will inquire immediately upon arriving in Melbourne concerning the largest orange-growing districts in Australia, and also make inquiries as to the best places for observing *Icerya*, aside from Adelaide. If you will visit the Botanic Gardens in Melbourne you will be able to get some information there. Baron Von Mueller, formerly director of the Botanic Garden, is still a resident of that city, and you will find him a very well-informed person to consult. I inclose letters of introduction both to Mr. Crawford and to Baron Von Mueller.

We shall hope for good results from Mr. Koebele's investigation, for we have no one connected with us who is more careful, capable, and persistent in field investigations.

New England Butterflies.—We are glad to learn from Mr. Scudder that his great work on New England Butterflies is now rapidly printing, and he hopes to get the first part out early in the autumn. From what we know of this publication and the great care and ability of the author, we anticipate the most thorough and creditable piece of entomological work ever published in this country.

NOTES ON THE ROCKY MOUNTAIN LOCUST.

WEST POINT, NEBR.,
August 28, 1888.

DEAR SIR: In accordance with your letter of instructions accompanying that of the honorable Commissioner of Agriculture, I left home on the 9th day of the present month for a short tour of the northwestern portion of this State and adjoining portions of Dakota and Wyoming, to examine into the subject of the Rocky Mountain Locust, so as to be able to report as to its future possible depredations; also to collect the various species of locusts to be met with at the different localities where halts were made.

I accordingly made the first halt at Valentine, near Fort Niobrara. Here, although it rained and was cloudy during the entire day, quite a number of very interesting locusts were captured. Among these but two specimens of the migratory species were found, although special search was made for that particular kind. Inquiry among the surrounding settlers and officers of the fort proved the almost entire absence of the pest for a considerable number of years.

At Chadron a second stop was made. Here, also, collections were made, with fair success; but not a specimen of *M. spretus* found or reported by the many persons interviewed. Here the "Bad Lands" fur-

nished a species of *Trimerotropis* which may be new, as did the grassy bluffs near Valentine one belonging to the genus *Mesops.*

The next halt was made at Buffalo Gap, Dak., where I took the stage for Hot Springs, a point 15 miles distant and much better situated for making collections in the *Acridinæ.* A portion of two days was spent here and some collections made, with the result of greatly extending the known range of a number of species. No new material was found.

From this latter place I hired a team, in company with a commercial man, to Custer. At this place much interesting material was taken, and Harney Peak, the highest point in the Black Hills, visited, upon the summit and upper slopes of which sub-alpine forms of *Melanoplus* and *Pezotettix* were taken. One of these, possibly two of them, may be new. A good series of all were obtained, notwithstanding the difficulty with which the mountain was climbed, the distance traveled, and the rain that fell during the day. The altitude of Harney Peak is just about 8,000 feet above sea-level. Collections were also made at about 5,000 feet elevation. At this latter elevation a species of *Arcyptera* was obtained that is new to me, possibly new to science.

Having visited the most interesting portions of the Black Hills region for the collection of Acridians, and not hearing of any locust depredations to the northward, it was decided not to visit Rapid City, but to return to Buffalo Gap via the Hot Springs. Just before starting I learned of the presence of the Army Worm (*Leucania unipuncta*), about three miles from Custer. The description was so perfect that the identity of the insect was sure. My informant claimed that but a single field of oats had been injured.

At Fort Robinson, Nebr., a second army-worm depredation was brought to my notice, this time receiving my personal attention. Here, as at Custer, but a single field of oats was injured, and if attended to, the pupæ, which had just formed, can mostly be destroyed, and prevent the possible greater injury next year.

Here collections were made in the family *Acrididæ*, but no new species added. Some of the western or Rocky Mountain species were found, thereby extending their hitherto known range considerably farther eastward.

At this point I was enabled to meet quite a number of Army officers and troops who had recently been over different portions of Wyoming, Colorado, and Utah, and from them learned that the Rocky Mountain locust is nowhere present in these parts in more than ordinary numbers. To be entirely satisfied as to the possible mistake of these different persons with whom I spoke on the subject, I went as far west as Douglas, Wyo., only to find *spretus* entirely absent there. Inquiries here also went to show that this pest is nowhere to be found within the region mentioned, nor had any damage been reported since several years ago. Here, also, some scattering injuries by the army-worm were

reported, but not in such numbers as those mentioned above. At one or two localities, viz, on Upper Powder River, and at a point about twenty-two miles west of Douglas, native hoppers of various kinds had done some little injury to gardens, but nothing further.

Finally, unless there should be swarms at present unknown to me in Montana, Northern Dakota, and the British Possessions to the north—and the swarms of Ottertail County, Minn., and neighborhood have been pretty well reduced—there is no danger of an invasion for several years to come.

Very respectfully, etc.,

LAWRENCE BRUNER,
Special Agent.

Prof. C. V. RILEY,
U. S. Entomologist, Washington, D. C.

INJURY DONE BY ROACHES TO THE FILES IN THE TREASURY AT WASHINGTON.

In consequence of the injury done to certain valuable documents on file at the Treasury Department by insects or mice, the following letter was written to the Department of Agriculture in May last:

TREASURY DEPARTMENT, OFFICE OF THE SECRETARY,
May 22, 1888.

SIR: The Secretary's files of this Department are being seriously injured by the ravages of insects or vermin, and with a view to the adoption of some means for their extermination, I shall esteem it a favor if you will authorize Prof. Charles V. Riley, or some equally competent officer, of your Department, to make an examination of the matter and recommend such measures as shall enable this office to protect its files and records from further mutilation.

Very respectfully, yours,

HUGH S. THOMPSON,
Acting Secretary.

Hon. NORMAN J. COLMAN,
Commissioner of Agriculture.

In answer to this, we sent Mr. Townsend with the following letter to the chief clerk of the Treasury Department:

U. S. DEPARTMENT OF AGRICULTURE, DIVISION OF ENTOMOLOGY,
May 23, 1888.

DEAR SIR: In accordance with instructions from the honorable Commissioner of Agriculture, given me at the request of Hon. Hugh S. Thompson, Acting Secretary of the Treasury, I send the bearer, Mr. Townsend, an assistant in this Division, to examine the rooms in which the damaged records are stored. Will you kindly allow Mr. Townsend every facility for this examination? Upon his report my recommendation will be based.

Yours, respectfully,

C. V. RILEY,
Entomologist.

Mr. E. B. YOUMANS,
Chief Clerk, Treasury Department.

Accordingly Mr. Townsend visited the Treasury May 23, 1888, and was shown every attention by Mr. Youmans, who in person took him all through the building, and assisted him in making the following observations:

PERIPLANETA AMERICANA.

The basement was first visited and many books examined which had the entire backs eaten off. These were old as well as more recently bound books and were on shelves away from the floor, all being in as dry and favorable situations as are to be found in the basement. No specimens were found at work. Those found had been killed by the insect powder which had been applied all over and around the records the afternoon before, and were lying on their backs. They were the large native species only, *Periplaneta americana*, there being none of *Ectobia germanica*, the smaller common roach (called also "Croton Bug" and "Water Bug"). No live roaches had been noticed that day, not having up to that time re-appeared. All those that had been covered with the powder had died. A large number of copies of the "Senate Report upon Methods of Business in the Executive Departments," which had just been bound (printed March 8, 1888), and were piled up from the floor, were half of them eaten into in patches over the backs and covers outside, presenting a corroded appearance. These reports are sparingly sent out on account of their value and importance. A specimen set, showing the injuries by the roaches, will be sent to this Division. These books were bound in black cloth and had been eaten into for the paste with which the cloth was put on the covers. It was for the same reason that the backs of the other older, leather-bound books had been eaten away. Specimens of excrement found on the shelves near these books no doubt belong to *P. americana*, and the places eaten had similar excrementitious spots upon them. Many of the records stored here are of the utmost value and importance, some of which it would be utterly impossible to replace, but all are liable to be treated alike by the roaches. In the macerating room large roaches also occur. The large species seems to go no higher than one or two stories, and very few of them above the basement. The basement is naturally somewhat damp, is heated by steam in winter, and the roaches have been worst in the darker places. They have not been as troublesome in winter. It also seems that there were more of them in west wing of the building, and not so many on the east side of the wing, the windows of which open into the inner court, as on the west side. The injured records are stored in the basement of the west wing. The walls are very solid, being of stone or iron, with very few cracks or holes therein, and none in immediate vicinity of books most eaten. The corridor outside these rooms is said to be full of the roaches in the early morning.

ECTOBIA GERMANICA.

Upstairs all above second floor, only this species occurs. None whatever occur in the library, which is kept very clean and neat by the lady

in charge, and the rooms are light and dry. In file-rooms on top floor, where only papers are kept (east wing), there are no roaches either large or small. There are no pasted records of any kind in these file-rooms, and employés are not allowed to take any lunch there. The rooms are dry and light, having sky-lights in the roof. No insects of any kind are found there unless brought from other parts of the building, when they soon disappear. The binding room on same floor, and connected with the file-rooms by narrow passages, was visited and *E. germanica* found there and also in printing room next to it. Numerous live specimens in drawers and under books in office, off printing room, were found. Also specimens were seen in these drawers which from the description given me were probably the imago of the clothes-moth. The printing office was formerly in basement where the eaten records are now stored, and these records were at that time kept in the room now occupied by the printing office, which is on top floor. The present change was made out of humanity to the employés, for whom the basement proved too unhealthy. But the basement seems to be equally unhealthy for the records, though from not exactly the same cause. In a room on top floor where some light-house records are stored, some of the smaller species are found, and a number of small paper-bound reports (bound in blue paper) had the backs partly eaten away, evidently to get at the paste. This work did not resemble that of mice, nor did any that I examined. Steam heater in this room.

OTHER INSECTS.

No flights of white ants have been noticed in basement by employés questioned. No other insects which could have any bearing on this question had ever been seen there, and the rooms are not troubled with mice.

REMARKS.

Mr. Youmans believes that dampness or dryness affect the insects very little, but that they stay where there is food to their liking. The safety of these files before referred to is of very serious importance to the officers of the Department, as the chief clerk is held responsible for them all (whether eaten or otherwise), and is supposed to be able at any time to produce any record called for. He can not say it is not there, because a copy has been filed with him; nor can he say it has been destroyed, because there is no law for the destruction of any record. The law does not recognize the agency of insects in this regard. In all these cases of injury it was only those parts permeated with paste that had been molested; therefore as a remedy for the future it would seem advisable to use a *poisoned paste* in the binding of the Government publications.

On May 24, 1888, specimens of the roaches and a sample set of books

were received from Mr. Youmans. The following recommendations were then made:

U. S. Department of Agriculture, Division of Entomology,
May 26, 1888.

Dear Sir: I take pleasure in acknowledging the receipt of yours of the 24th transmitting specimens of cockroaches from your building, and also acknowledge with thanks the receipt of the volumes of the "Senate Report upon Methods of Business in the Executive Departments." The cockroaches sent are not the big Oriental Cockroach, as I had supposed from your description, but belong to the native species known as *Periplaneta americana*, and it is quite evident that this insect alone is the cause of the damage to your books. Under these circumstances I can add nothing to my verbal advice of the other day, which was to use thoroughly and persistently the California Buhach, which Mr. Townsend tells me you have already purchased. This substance does not act upon the roaches instantly, but very few recover which have been touched by it, although they may take a day or so in dying. It has been used with great success in badly-infested houses.

Respectfully, yours,

C. V. Riley,
Entomologist.

Mr. E. B. Youmans,
Chief Clerk, Treasury Department.

FURTHER NOTES ON THE HOP PLANT-LOUSE (Phorodon humuli).*

At our last meeting I gave some account of investigations which, up to that time, I had made on the life-history of the Hop Plant-louse, proving that it does not hibernate on the ground nor in any part of the hop-yards, but that it migrates in autumn from the Hop to different species of Plum, both wild and cultivated, and winters on the twigs of the same in the egg state. That communication was made in August, and left some facts covering the period from that time until the ensuing spring problematical and to be ascertained by further investigation. I have since persistently followed up the matter, both in this country and in Europe, and can best supplement the article of a year ago by quoting the following from a communication to the *Gardener's Chronicle* of England for October 22, 1887:

"During the hop harvest (this year in Kent at its height the last week in September), and some time prior thereto, the insects are fast getting wings. This is the only winged generation produced on the Hop, and all individuals, irrespective of brood, show the tendency to become winged, so thoroughly is aphid life, like plant life, influenced by temperature and season. The first to get wings are agamic females, and they instinctively leave the hop-yards and settle upon different varieties and species of Prunus, and begin at once to breed and bring forth young. Their flight is much influenced by meteorological conditions, but they swarm in the air during mild and pleasant days. On my very

* Paper by C. V. Riley before the Society for the Promotion of Agricultural Science, Cleveland, Ohio, August 21, 1888.

first visit to Maidstone several settled on my person while I was being driven from the station, and where wind and temperature were favorable I have known them, in a single day, literally to cover certain sheltered Damson trees close to a hop-yard, where but few could be detected upon the trees the previous day. They array themselves on the underside of the leaves, heads generally all in one direction, and in a very few days they are intersprinkled with their pale and wingless young, though each produces but four to five before dying. These wingless individuals are the only generation produced in autumn on Prunus, and are the true sexual females. White at first, they become yellowish-orange and olivaceous with maturity, the head and the members darkening. The last to acquire wings in the hop-yards are males, and they settle upon the plum leaves (this year most numerously October 5), and fecundate the females, which thereafter lay a few eggs (not more than four or five) around the latent buds, and in any crack or sheltered part of the twigs, especially of the previous year's growth. The eggs, at first yellowish-green, soon get darker, and finally black, and become, in time, more or less covered with dust particles, mold, the exuviae of mites, etc., which adhere by means of the sticky 'honeydew' everywhere produced by aphides.

"The winged males are easily distinguished from the winged females by their smaller size and greater unrest, and when the former are most abundant the latter have disappeared. At the present writing the males are fast dying, and drying up, but the impregnated females still survive, though there have been snow and several white frosts. Some of the later born will doubtless live on till the leaves have fallen; but all will perish with the first severe frost, and the species will be perpetuated through the winter egg, as already set forth. The first eggs were observed on the 8th of this month. My observations show that the winged emigrants from the Hop, while preferring the Damson, feed and breed on all other varieties of Prunus which I have had an opportunity of examining, and which include the Bullace (a yellow plum), the Victoria (large red), the Black Diamond (large black), the Yellow Gage, the Green Gage, and the Orleans. Trees examined in counties where no hops are grown reveal only the Plum aphis (*Aphis pruni*). This species, which remains on the Plum the whole year, also occurs in late autumn in the agamic winged female, the winged male, and the wingless sexual female forms; and though often mixed with the Hop Phorodon, is easily recognized by the want of cornicles or projections at base of antennæ, and by the greener color, darker members, and black eyes of the true female, which oviposits in similar situations as the Phorodon, and whose eggs are scarcely distinguishable from those of that species.

"The absence of Phorodon multiplication on the Hop, and the manner in which stray plants in the field or hedgerow are forsaken, while what I have described is going on upon the Plum, is as marked as the free-

dom of Plum in early summer after the winged migration therefrom to the Hop.

"The observations here recorded have shown (as such minute observations always do) the unreliability of inexpert testimony. As in America, this has been a year of exceptional freedom from hop-lice in England, and when I first visited the hop-yards at the commencement of the gathering I was told very generally by laborers and owners that no lice had been noted lately, whether on the Hop or on the Damson, and that I should find none. Yet, though the leaves of the Hop were remarkably free, I had no difficulty in finding the lice in the burrs, or crawling in all conditions through the loose texture of the sacks which were being filled by the pickers, while the first deposited on Plum were detected on the very first tree examined.

"In conclusion, I have been struck with the great similarity in the general aspect of things both on the Hop and the Plum here and in America. Everywhere parasites and predaceous enemies of the lice, belonging to the same or similar genera, and in some instances the same species, and everywhere the omnipresent Red Spider (*Tetranychus telarius*), and its equally omnipresent spherical reddish eggs at this season. And while the lower average summer temperature will cause fewer generations of the Phorodon to be produced in England (probably only six or seven) than in America (where thirteen have been traced this year), and the beginning and ending of the insect's activity will be more abrupt there than here, yet in all essential points the life-history of the species in the two countries is the same."

These facts which I obtained in England were independently confirmed by my assistants in this country during the same period, and the correspondence between the facts observed on both sides of the Atlantic has been set forth in a communication to the *Country Gentleman* for November 17, 1887, by my first assistant, Mr. Howard, from which I quote the following:

"Professor Riley's observations in England I shall quote in his own words from a communication written to me from Maidstone, October 8. The exact correspondence is marked, and is even surprising when we consider the different conditions of temperature and rain-fall.

"'I shall be able after all to get to the continent without intrusting any one else here with the *finale re Phorodon.* I have the whole thing complete. Egg laying began not more than two days ago, and with the last two warm, pleasant days it is going on rapidly, the males being active in fecundation. I have not much time to write, but the facts are all as pat and clear as day here. From middle to 25th of September, while hops were being gathered, the winged females were developing and leaving the hops. On Prunus of all varieties—but particularly on Damson—they settle and begin to feed and produce young. When weather and wind are favorable I have seen them cover trees in two days so that every leaf would have a dozen or more, generally heads

all one way, and their pale young would soon begin to get abundant. However, they are not so very prolific, and produce at most half a dozen young. These, without exception, are the true females, so far as I have been able to make out, and develop slowly according to temperature, the earliest produced only just now laying. About the time the winged females begin to die the winged males take their places and fecundate the wingless females so soon as these are sufficiently mature. The appearance of the winged males settling in all positions, and restless, is quite in contrast with that of the more plump and sedate winged females.

"'This means that the last generation from Hop gives us the winged parthenogenetic female (return migrant) and the winged male—the latter somewhat later than the former and representing the remnant or devitalized residuum—the closing nutrient power of Humulus being sufficient to produce a male, but not a female! So that only the true sexual female is produced on Prunus in autumn.

"'From appearances she will not lay more than five or six eggs, and these are placed as in *pruni*, *mali*, etc., by preference around base of nascent or latent buds and in cracks and crevices of last year's growth, though sometimes (destined to perish) on leaf or smooth, green stem. They are smooth and olive-green at first, becoming darker. * * * The essential facts which I have published are all verified.

"'The true females are all white at first and indistinguishable from young of other generations, but they gradually grow more orange and then olive, the head and members getting darker, and the anus, especially after coition, black.'"

The statements therefore in my paper of a year ago are substantially correct, and the principal facts ascertained since may be thus briefly summarized:

(1) The insects begin getting wings in autumn irrespective of generation. These winged females may either come from the fifth generation of the year or as much as the thirteenth, thirteen generations having been followed during the year 1887.

(2) The males uniformly appear after the females and after the hop crop is harvested. Hence it becomes extremely important to destroy by fire or by thorough drenching with a strong kerosene emulsion all the hop-vines as soon as possible after the crop is harvested. This would cut off the larger bulk of the males so that there would be no impregnation of the sexual females, which are for the most part at that time already on the Plum.

Another interesting fact is worthy of record here; it is the small proportion of eggs which survive the winter. In the fields and orchards where my observations were made in England some trees were literally covered with eggs, and I brought a number of them with me to this country. The same was true of the plum trees in New York, which were under observation by my assistants. Some of them were literally

covered with winter eggs. I watched them carefully, not only by means of those brought with me from England, but of others brought from New York in the late fall or early winter, and still other specimens repeatedly received during the winter from Richfield Springs. As the hatching period approached I was quite surprised to find how many of the eggs shriveled up and perished. I also made it a point to be on the spot as soon as vegetation began at Richfield Springs, and found there, in a state of nature, the same mortality among the eggs. The large majority of them that had escaped natural enemies had perished by shrinking and shriveling. Again, the stem-mothers, which hatched on Plum last spring, though they were few compared with the number of eggs that had been provided, were for the most part lost through storms or the working of natural enemies, so that a very small proportion succeeded in developing. A number of additional interesting details of an entomological character have been obtained since the last meeting of the society, but they will be brought together in a forthcoming report from the Department of Agriculture.

The whole record has been rendered the more difficult by virtue of the occurrence of a very closely allied species (*Phorodon mahaleb*), which, though hatching at the same time as, and very similar to, *humuli*, does not migrate to the Hop, but goes to various other plants of no importance in cultivation.

LIFE-HISTORY OF GRAPTODERA FOLIACEA Lec.

BY MARY E. MURTFELDT.

In Bulletin No. 3 of the Kansas Experiment Station Professor Popenoe has a very interesting illustrated article on what he denominates "A New Apple Insect." This paper was the more interesting to me inasmuch as it anticipated—in the matter of publication—certain observations of my own on the same species.

About the 1st of June of the present year a correspondent sent me, from Colorado, a package containing a dozen specimens of a flea-beetle, closely resembling in size and form the Grape-vine Flea-beetle (*Graptodera chalybea*, Illig.), but differing in color, being of a highly polished metallic green instead of blue. The apple leaves inclosed with these specimens were riddled with small, irregular perforations, and I was informed that these leaves correctly represented the condition of the foliage of most of the young trees in an extensive nursery—that of the Stark Bros., near Denver, Colo.

As the species was unknown to me, I inclosed specimens to Professor Riley, who kindly determined them for me as the species under consideration. Professor Riley informed me that he had observed the work of the beetle and its larva in Missouri in 1872 feeding upon Hawthorn; also in 1877 in Colorado, and had published a brief account of it and its

life-history, with a description of the larva, in the *Scientific American* for June 16, 1887, and in the *Gardener's Monthly* for July 19, 1887 (vol. 29, p. 216), under the name of *G. punctipennis*, which is a synonym of *foliacea*.

I placed my beetles on fresh apple leaves and awaited developments.

More than a month elapsed before I found any eggs in the jar. On the 9th of July I found several clusters attached to the stems and bases of the midribs of the leaves. They are generally in twos and threes, ranged side by side. They are about one millimeter in length, slender, oblong rather than oval, of a pale, dull orange color, somewhat translucent, and Professor Popenoe, who has also obtained them, says that "under a high magnifying power the shells are seen to be minutely granulated."

By the 17th of July a number of larvæ had hatched. They are nearly cylindrical, of a dull black color, and rather more elongate in proportion to their diameter than the larvæ of *G. chalybea*. When grown they feed on the parenchyma of the leaf, indifferently on either surface, but later they gnaw holes in it similar to those made by the perfect insects. The first molt took place in eight days, and two or three of the small larvæ perished in the process, being unable to entirely withdraw themselves from the outgrown skins. The second molt occurred one week later, and in this also one larva perished. During these periods there are no changes of color or maculation. August 2 one larva had completed its growth, and as it was making its way into the earth I put a stop to its further development by transferring it to the alcohol bottle. The following characters were noticed: Length of mature larva from 6 to 7 millimeters; diameter, $1\frac{1}{2}$ millimeters; form, cylindrical, tapering somewhat posteriorly; general color varying from dull black to dark fuscous; piliferous plates inconspicuous, of the same shape, number, and arrangement as those of *G. chalybea*, black in color and slightly polished, each giving rise to from one to three minute hairs; head rounded, cordate, deep black, but not brilliantly polished; prolegs well developed, faintly annulate at the joints with dingy white.

The larvæ move about considerably, but in a slow and rather clumsy fashion, with the tip of the abdomen appressed to the surface of the leaf or stem to assist in keeping them in position.

The pupa is inclosed in a frail earthen cocoon or cell, just beneath the surface of the ground.

None of the beetles from this brood have emerged, and it is possible that they may hibernate. Several of the parent beetles were, August 14, still alive and as voracious as ever, while eggs and young larvæ were still to be found on the leaves.

August 14 two larvæ entered ground and the beetles emerged on the 28th of the same month—the duration of the pupal stage of life, being less than two weeks.

September 1. The last beetles of the spring brood have just died, possibly from a lack of fresh food more than from old age, as I was absent from home and could not give them personal attention. The probabilities are that the second brood of these beetles hibernates and lays its eggs early in the season for the production of the beetles that are so destructive throughout the summer.

It will be seen from this account that *G. foliacea* is an all-summer pest and capable of inflicting a vast amount of injury in the nursery and young orchard.

The gentleman from whom I obtained the specimens wrote me that he had tried in vain to check its ravages with pyrethrum, kerosene emulsions, Paris green, etc., in the proportions and by the methods usually recommended, but that he had succeeded in destroying it without injury to the trees by the use of white arsenic, 1 pound to 200 gallons of water, the arsenic being first boiled in a small quantity of water and then diluted to the proportions given above.

A MAN-INFESTING BOT.

[Extracted from a paper* by RUDOLPH MATAS, M. D.]

On the morning of June 27, H. T. McC., an Englishman, aged thirty-eight, presented himself at my clinic in ward 8, Charity Hospital, stating that he had arrived in this city one week before from an extensive trip to Spanish Honduras, where, on or about the 11th of this month (June), he had been stung, while bathing, by a peculiar fly, which was well known in that country, as it was a veritable nuisance, if not a scourge, because it attacked man and beast alike—the white foreigners especially—and deposited its ova in the sting, wherein the "worms" (larvæ) developed until they attained considerable dimensions—half to three-quarters of an inch in length, according to the patient's statement. He further stated that he remembered the moment when the fly stung him, for he heard it "buzz," and felt it "sting" him in three distinct places on his body, where he was sure the "worms" were now growing, "though they must still be quite young and small, on account of the comparatively short time that they had been in the flesh"—*i. e.*, sixteen days since ova had been deposited.

We then examined the patient, who, after undressing, showed us three red, hard, furuncular swellings, situated, one on the right side of

* This paper was published by its author, Dr. Matas, Visiting Surgeon, Charity Hospital, New Orleans; Demonstrator of Anatomy, Medical Department, Tulane University, at New Orleans, in September, 1887, for private distribution, under the title "Report of the case of a patient from whose subcutaneous tissue three larvæ of a species of *Dermatobia* were removed; with remarks." Dr. Matas has had considerable correspondence with the Division and we may have some further remarks upon the subject in a future number.

the intergluteal furrow, about 2 or 3 inches from tip of coccyx, and two other similar, though smaller elevations on the left side of the same furrow and closely adjoining one another. The first, which was the most prominent, was elevated at its highest portion about one-quarter of an inch from the level of the surrounding skin, and presented a circular area of inflammatory hardness which measured about $1\frac{1}{4}$ inches in diameter. Upon careful and minute inspection the largest furunculoid mass was found to present in its most elevated and central portion a minute orifice, which might admit the point of a coarse bristle. The other two swellings presented also one central point each, where a little puriform crust had become fixed, indicating the original seat of puncture and entrance to the larval sinus.

Trusting to the patient's account of himself, we proceeded to the extraction of the parasites—a procedure which the patient urgently requested. Guided by the orifice in the elevation I cut with the point of a bistoury into the very center of the swelling, but discovered, however, that by simply cutting vertically I had not incised the cavity wherein the larvæ lay concealed, and was obliged to again incise obliquely and to the right in order to expose the parasitic burrow. This oblique direction of the larval sinus I found to be constant in each of the three "stings." I found that the larvæ were lodged immediately under the derma proper, so that in getting at them, in order to expose them thoroughly, I had to cut completely through the skin, which, in the gluteal region is particularly thick. It was discovered also that a simple incision was insufficient to remove the larvæ, and that digital expression, and this very forcibly applied, was necessary in order to induce them to relinquish their stronghold. In fact, the two last larvæ were removed more by this means than by incision, the orifice of the sinus having been simply incised in order to enlarge the orifice of exit, and the parts expressed by pinching them in a fold of skin. The patient stated that in Honduras the natives usually rid themselves of these unpleasant guests by applying hot tobacco ashes to the parts and following this up by digital expression. This is a rather general treatment for parasitic dermal affections in Latin-American countries where tobacco is always on hand. In our patient's case we cauterized the cavity or sinus left by the evacuation of the larvæ with pure carbolic acid, for fear that the septic products of larval nutrition might tend to create inflammatory mischief. I was led to this precaution because of the unfortunate results which followed the extraction of similar parasites in another case, that of a Frenchman, also from Honduras, who was admitted in the same ward during my absence, about twelve months before, and who nearly succumbed to a most violent and disastrous attack of erysipelas, which supervened immediately after the slight traumatism inflicted in the extraction. The larvæ had been deposited in the inner surface of the left arm, and from this point the inflammation spread on all sides, swelling up the whole extremity and left thoracic region. Subcutaneous

suppuration, accompanied by gangrene, followed, finally leaving the arm in a state of permanent contraction in the flexed position, as the result of cicatricial action. Happily, in the present case, the extraction of the larvæ has not been followed by any excessive inflammatory reaction, owing, perhaps, to the general good health enjoyed by the patient at the time of the operation.

Since this case has come under my observation I have been informed that similar instances of larval deposits in the skin have not been rare in the hospital, at least since the Panama Canal and other enterprises have increased the traffic between this port and the Central American Republics. I have been informed, in fact, that on one occasion quite a number of returning laborers or immigrants were admitted in various wards of the Charity Hospital suffering with these parasitic larvæ. But of these cases no report has been presented thus far, and to my knowledge at least no attempt has been made to discover the parentage of the larvæ or even to determine their proper entomological characters. The specimens removed from my patient are the first that I have seen, and I believe are the first that have been preserved for examination and, certainly, for the inspection of this association. At any rate these larvæ are certainly not familiar to our parasitic pathology, for our texts, and even those that devote special attention to parasitology (Cobbold, Leuckart, Davaine), are almost barren of all information in regard to them; so that it is necessary to appeal to the special entomologists to obtain some clear notions as to their exact taxonomic characteristics.

In view of our prospects of increased relations with Spanish America, and of the probability of a future importation of similar specimens, I have thought it a matter of some interest to this society to inquire into the natural history of these hypodermatic parasites, in order that we may at least possess ourselves of some clear ideas respecting them, so that they may prove more familiar acquaintances when we are again confronted by them.

The three specimens that are now under the microscope before you are mounted in a glycerine cell, a preparation which was kindly made at my request by the gentlemen in charge of the pathological department of the hospital. The larvæ are smaller than they appeared in life, as they have contracted slightly. The largest of these measures about 4 or 5^{mm} in its long diameter and is about $1\frac{1}{2}^{mm}$ in breadth. To the naked eye they present an elongated pyriform or clavate appearance, the broad, thick and rounded portion corresponding to the head and trunk, which were the parts furthest from the surface of the skin; the long, tapering or caudal extremity pointed upwards, so that in squeezing the larva out of its lodgment the tail end appeared first. As the caudal extremity presented itself a dark red dot was visible at the very extremity. This corresponded to the dark anal extremity containing the stigmata for respiratory purposes, and is characteristic of, though not peculiar to, the *Dermatobia* larvæ.

This is the normal position of these parasites in general, for the respiratory apparatus which is attached to the caudal portion, close to the anus, is placed near the opening originally made by the sting of the parent fly, in order that they may be as close as possible to the atmosphere. When the larvæ were extracted they wriggled quite actively in their vermicular movements, and continued to move until they were embalmed in the cell five or six hours after their extraction.

On microscopical examination of the most perfect specimen (with a low-power three-quarter objective, B. and L., eye-piece B.) a remarkable appearance is presented. The major portion of the parasite is seen to consist of an elongated, pyriform, tuberose, or exaggerated clavate body, apparently concave on the ventral aspect and convex dorsally, terminating in a long, tapering, glabrous, elongated-pyramidal extremity. The broader and truncated part of the larva is opaque, and none of the contained organs can be distinguished. The external surface presented the curious appearance which is well displayed in Fig. 10 (*a* and *b*).

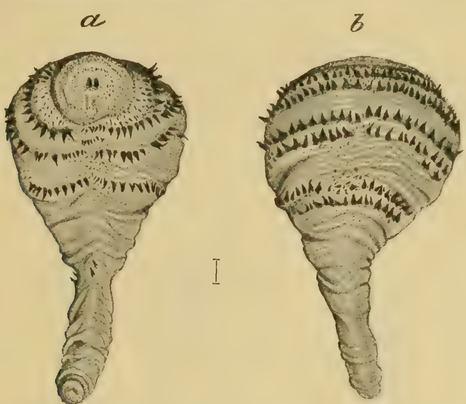

FIG. 10.—One of the larvæ viewed in its *ventral* (*a*) and *dorsal* (*b*) aspects. At *a* is shown the ventral aspect and the appearance of the cephalic and caudal extremities, also the three rows of spines single below, and the point where the double dorsal rows end; *b* gives the dorsal view and shows that the three rows of spines single below are double above. Hair line between indicates the natural length. (From drawings made for the author by courtesy of the U. S. Entomologist.)

Corresponding to the three dark zones distinctly outlined with the naked eye are seen three *double* rows of black hooklets or spines, which are distinctly shaped, when examined carefully, like the thorns of a rose stem. They are lamelliform, sharply pointed at the ends, and are curved and directed (the majority) towards the caudal extremity, so that, if embedded in the tissues lining the larval sinus, they would offer a resistance to caudal traction in direct ratio to the force employed. This arrangement is manifestly calculated to assist the larva in retaining its position in the subcutaneous tissues, and especially in prevent-

ing any involuntary migrations from regions subjected to great muscular disturbance. They may also assist in burrowing, though advance or head movements do not appear to be habitual with these larvæ, as they, in common with most ectodermic parasites, are not anaerobic (to use a Pasteurian phrase), but require the presence of atmospheric oxygen for their maintenance.

As regards the disposition of the spines it is a noticeable fact that they differ markedly as to their arrangement according to the aspect of the parasite examined. Thus, as is plainly shown in Fig. 10 (*a* and *b*), the three rows of spines are single on the ventral and double on the dorsal aspect, the point where the double row ceases being plainly shown in *a*. This peculiarity is also distinctly exhibited in the species illustrated by Fig. 11, plainly indicating the relationship that exists between them.

The only segments that are distinctly outlined are the first, which represents the cephalic end, containing the oral cavity, armed with two styles, Fig. 10 (*a*), and the second, which immediately follows it. As these specimens have shrivelled considerably since the time of extraction, the segmentation is not as plainly visible as it should be.

The caudal extremity is also distinctly shown, though the details of the stigmatous organs are not as plainly delineated as desirable, as the stigmata are doubtless hidden within the anal fissure. In this respect they differ from Brauer's (Fig. 11, *a*, *b*, *c*) and Coquerel's (Fig. 11, *d*) specimens of similar larvæ, with which they otherwise appear to be closely related.

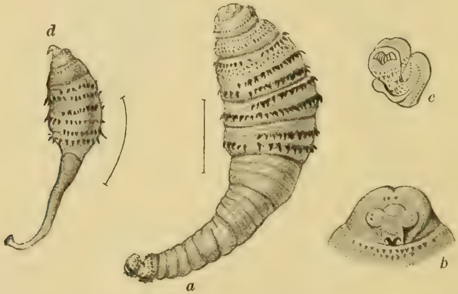

FIG. 11.—*a*, Brauer's figure of entire *Dermatobia* larva, supposed to be closely allied to specimens shown in Fig. 10; *b*, cephalic extremity; *c*, caudal extremity of same specimen; *d*, *Dermatobia* larva figured by Coquerel, and closely related to if not identical with preceding, only seen under a lower power and perhaps in an earlier period of development. (From figures kindly furnished by the U. S. Entomologist.)

In addition to the three rows of hooklets, a large number of small punctiform and blackish tuberosities are seen dotted in a somewhat concentric manner above the upper row on the two upper segments and the vicinity of the oral point.

STEPS TOWARDS A REVISION OF CHAMBERS'S INDEX,* WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord WALSINGHAM.

In attempting a gradual revision of the late Mr. V. T. Chambers' Index of the Tineina of the United States and Canada, published exactly ten years ago, I do not propose to take the genera in systematic order, nor alphabetically as in the original publication. I shall commence with those genera at present best known to me and in which the material at my disposal is sufficient to enable me to add something to the knowledge of the subject. It will be easy to compile a new list if the revision should be ever completed. I fear it may be some time before any satisfactory knowledge can be obtained of the majority of the species in the great genus *Gelechia*. The genera *Lithocolletis*, *Gracilaria* and *Tinea* also present considerable difficulties to any one who is not in a position to examine the types of American authors. I hope that by publishing the lists of different genera from time to time I may call forth some useful observations from others who are acquainted with the subject, and thus accumulate material for a complete catalogue. To Dr. Riley, Professor Fernald, and Miss M. E. Murtfeldt I am constantly and gratefully indebted for specimens and information.

CLEODORA, Curt.

Two species of this genus have been recognized by Chambers as occurring in the United States. Both are described by him in the sixth volume of the Canadian Entomologist, p. 245, and both are subsequently referred to by the same author in the Bulletin of the United States Geological and Geographical Survey, Vol. IV, No. 1, pp. 91–92. These are *Cleodora pallidistrigella* Chamb. and *Cleodora pallidella Chamb.*

The first is said to differ slightly in its neuration from the European type of this genus. It is described thus: "Thorax and primaries pale orange; paler, nearly white along the dorsal margin and on the extreme costa beyond the middle; a narrow, indistinct, whitish line along the fold, ending at a small brown spot; there is an oblique, narrow, whitish streak along the base of the costal cilia; a minute brownish spot surrounded by a pale ring at the end of the disk, and an oblique brownish streak in the cilia at the apex. The brown spots are all indistinct. The palpi pale yellowish; a spot on the top of the third joint and the brush on the second joint reddish ochreous. Al. ex., ⅝ in."

Under the second of the two references given above, the descriptions of both species are amended and elaborated, but some of the amendments to the description of *C. pallidella* can only apply to that of the other species, the spelling of which is here corrected to *C. pallidistrigella*. The wide range of variation indicated points to the probability that Chambers had before him at the time more than two allied species of this genus. I have had an opportunity of examining a specimen of *C. pallidistrigella* from Texas, lent me by Professor Riley and received by him from Chambers as a type of the species. A coloured drawing of this specimen is now before me. It

*Index to the described Tineina of the United States and Canada. V. T. Chambers. Bull. U. S. Geol. and Geog. Surv. IV (1), February, 1878.

is certainly a *Cleodora* distinct from all American and European species with which I am acquainted, although somewhat resembling in general appearance *Cleodora striatella* Hb.

A specimen of *C. pallidella* is, I believe, in the collection of Miss Murtfeldt, but I am not acquainted with the species.

The only other allusion to the genus *Cleodora* as possibly occurring in America is to be found in Stainton's edition of Clemens' papers, p. 111, where in a foot-note the editor mentions that he is not confident that *Anothosia* Clem. is generically distinct from *Cleodora*. Chambers (Can. Ent. VI, p. 245) discusses and rejects the theory of their identity chiefly on the grounds of neuration and of the form of the palpi. The palpi of my single specimen of *Anothosia* certainly resembles those of *Pleurota* more nearly than those of *Cleodora*.

The figure of the hind-wing of *Parasia* in Stainton's Lepidoptera Tineina (Insecta Britannica) indicates scarcely sufficient indentation before the apex. In this respect *Parasia* more nearly resembles *Cleodora*, from which it differs chiefly in the form of the palpi. The neuration of the fore-wing of *Parasia* also differs from *Cleodora* in respect of the addition of a second costal branch to the apical vein, and this is the same distinction mentioned by Chambers as characterizing his North American species of *Cleodora*; nevertheless, his specimen of *pallidistrigella* seen by me was not a true *Parasia*. The following five species, of which four are new, may now be added to the North American representatives of this genus. The new ones, which have the strong brush on the palpi which distinguishes *Cleodora*, possess the same peculiarity of neuration as those described by Chambers. It is possible that when more material shall have come to hand a new genus intermediate between *Cleodora* and *Parasia* may be usefully characterized for their reception.

I hope at some future time to publish figures of these and many other North American *Tineidæ*.

Cleodora striatella Hb.

I took a single specimen of this species in Colusa County, Cal., June 20, 1871. It is exactly similar in all respects to the typical European form.

Cleodora modesta sp. n.

Antennæ, fuscous, faintly annulated with hoary scales.

Head and palpi, hoary.

Tongue, clothed at the base with hoary scales.

Thorax, greyish anteriorly, shading to pale umber-brown posteriorly.

Fore-wings, unicolorous pale umber-brown, dotted around the apex with intermixed fuscous and hoary scales; a line of white runs also through the middle of the apical cilia; cilia grey.

Hind-wings, pale greyish; cilia a with slightly darker tinge.

Abdomen, brownish, grey.

Legs, grey.

Exp. al., 10-11^{mm}.

Habitat, Los Angeles, Calif., July.

Type, ♀, *Mus. Wlsm.* 1 ♂, 2 ♀, in the collection of Professor Riley (U. S. N. M.).

Cleodora canicostella sp. n.

Head, thorax, and palpi, with long projecting tuft beneath; hoary grey.

Fore-wings, brown, with green or rosy iridescent tips to the scales, especially on the outer half of the wing, visible only in a strong light; the middle third of the costa narrowly white, the white streak widening outwardly; beyond it is an outwardly oblique costal streak which crosses the wing before the apex, followed by an inwardly oblique small white costal streak and some fuscous dots in the cilia;

along the apical margin runs a white line in the cilia between two narrower fuscous lines; there are a few fuscous scales at the anal angle and above them a short longitudinal white streak; a short fuscous streak beyond the middle of the fold almost reaches the commencement of a more conspicuous discal streak of the same colour immediately above it, both margined by a few inconspicuous whitish scales.

Hind-wings, brown, with a purplish tinge; the cilia brown.

Exp. al., 12^{mm}.

Habitat, Mt. Shasta, California, Aug. 1, 1871.

Type, ♂ ♀, *Mus. Wlsm.*

This approaches the Texan species described by Chambers.

Another species, or perhaps only a variety of the above, obtained on Burney Creek, Shasta County, Calif., a few days previously, has the costa white to the base, the fold white, and the white line in the fringes with its fuscous outer margin reduplicated

Cleodora tophella sp. n.

Palpi, with long projecting tuft of mixed whitish and cinereous scales beneath, slightly darker on their outer than on their inner sides, the apical joint shaded beneath.

Head, pale cinereous.

Antennæ and thorax, slightly darker.

Fore-wings, dull ashy brown, with a considerable sprinkling of brighter (more reddish brown) scales; the tips of the scales about the apical margin and cilia are paler and give a speckled appearance to the end of the wing.

Hind-wings, brownish cinereous; cilia scarcely paler.

Abdomen, the same colour as the hind-wings, with subochreous anal tuft.

Posterior legs, the same colour, the tarsal joints with subochreous spots.

Exp. al., 23^{mm}.

Habitat, specimens taken May 24, 1871, in Mendocino County, Calif.

Type, ♂ ♀, *Mus. Wlsm.*

I have specimens from Shasta County, Calif., July 24, 1871, which differ from the above in their smaller size (exp. al., 12^{mm}) and in their whiter heads and palpi, the tuft on the latter being less prominent. These probably belong to a second brood of the above species.

Cleodora sabulella sp. n.

Palpi, fawn white.

Head and thorax, rather more decidedly tinged with fawn-colour, the face paler.

Antennæ, annulated with fawn-colour, and fawn white.

Fore-wings, fawn-colour with a slight brownish tinge towards the apex, where there is some appearance of pale speckling owing to the tips of the scales about the cilia and apical margin being of a lighter hue.

Hind-wings, fawn colour, with a greyish tinge; the cilia fawn-coloured.

Abdomen and posterior legs, paler, corresponding more in colour with the thorax.

Exp. al., $14\text{–}15\frac{1}{2}^{mm}$.

Habitat, 18 specimens taken in Bear Valley, Colusa County, Calif., June 27, 1871.

Type, ♂ ♀, *Mus. Wlsm.*

DACTYLOTA* Snell.

This genus has hitherto been represented by a single species found on the shores of the Baltic and North Sea, in the west of Europe. It is immediately recognizable by the peculiar form of the hind-wings in the male, which are not merely emarginate below the apex, as is usual in the *Gelechinæ*, but are deeply excised, having the apical

* According to strict rules of nomenclature the name *Dactylota* is preoccupied in *Echinodermata* and should be changed.

margin of the wing divided into two finger-like lobes, the upper, or costal one, being double the length of the lower, or dorsal lobe. There is a slight difference in neuration between the North American and European forms, the species here described having the discal cell of the fore-wing not narrowed to a point, as in Snellen's figure (Tijd. v. Ent., XIX, Pl. I), and the veins that leave its margins are distinctly separate from each other at their bases; moreover, the apical vein, which is forked, throws its lower branch almost to the apex of the wing, or very closely above it. The long and slender apical joint of the labial palpi also serves to distinguish the American from the European species.

Dactylota snellenella sp. n.

Antennæ, simple; basal joint scarcely wider than the stem.

Palpi, recurved, slender; second joint longer than the head, clothed with short diverging scales beneath, smooth above; apical joint very slender, smooth, longer than the second, in this respect differing from *kinkerella* Snell., which has much shorter palpi.

Tongue, rather long, scaled at the base, naked beyond.

Head and thorax, greyish, sprinkled with brownish scales.

Fore-wings, elongate, broadly lanceolate, costa slightly arched near the base; with 12 veins, 7 and 8 from a common cell; greyish, sprinkled with brownish scales, having a slight iridescent hue in a strong light. There are 3 very conspicuous patches of very dark umber scales, the 1st within the basal fourth, adjacent to the upper edge of the fold; the 2nd within the basal half of the disk, slightly above the middle of the wing; the 3rd, at about the end of the cell, larger and more conspicuous than the preceding two, is followed by an ill-defined band of very pale grey scales, stretching from the costal to the dorsal margin; the apical portion of the wing is faintly sprinkled with similar pale scales; a narrow line of subochreous scales runs nearly parallel with the costa, from the base for about one-third of the length of the wing; a few dark umber scales are also observable about the middle of the fold; cilia very long, rosy-grey, sparsely dotted with brown along their base.

Hind-wings, ♂, shining, pale greyish, also iridescent in a strong light; as wide as the fore-wings; costal and dorsal margins parallel; apex produced, obtusely pointed; apical margin deeply indented, forming a short obtuse second lobe; the fissure is rounded at the base; abdominal angle rounded; the abdominal margin nearly straight; cilia very long, having an ochreous tint. On the under side is a tuft of long, hair-like scales from the middle of the base, lying parallel to the upper edge of the 2nd lobe.

In the ♀ the hind-wing, although deeply indented below the apex, is not divided into two lobes, its form being rather that of the genus *Cleodora;* the tuft of hairs on the under side is also absent.

Abdomen, greyish, rather wide and flattened; anal tuft faintly ochreous.

Exp. al., $17\frac{1}{2}^{mm}$.

Habitat, Arizona. 2 ♂ and 2 ♀ received from the late H. K. Morrison in 1883.

Type, ♂ ♀, *Mus. Wlsm.*

The species is named after the well-known author of "De Vlinders van Nederland," who, in one of his numerous and valued papers on Microlepidoptera, first described the European representative of this genus.

(*To be continued.*)

EXTRACTS FROM CORRESPONDENCE.

The Strawberry Weevil in Pennsylvania.

In the inclosed block I send you a few specimens of an insect which is causing a great deal of damage to the strawberry crop in this vicinity. I send a few buds showing how the mischief is done, and up to the present writing about one-half of the crop has already been destroyed, on some of the stalks not a berry being left. The inclosed specimens were caught yesterday in the act of cutting the stem; hence I send them to you and would like to know what species of insect it is, and could you suggest a remedy to stop further depredations, as I am anxious to save at least a portion of the crop. The injury amounts to hundreds of dollars on single plantations, at least so estimated by the number of blossoms cut off, some stalks having only two or three berries left and twenty or thirty blossoms. * * * In 1885 this insect made its first appearance, but in 1886 it was not noticed.—[Lawrence J. Krieg, Etna, Allegheny County, Pa., May 23, 1887.

REPLY.—Yours of recent date accompanying specimens of an insect which is damaging your strawberry crop has come to hand. This insect is the destructive Strawberry Weevil (*Anthonomus musculus*), which I treated at some length on pages 276 to 279 in my last report as Entomologist to this Department. I have to-day requested that a copy of this report be sent to your address, so you will be able to study the insect at your leisure. I have been unable to do much more than suggest remedies so far, as the life-history of the insect has not yet been made out. After reading the article carefully you may be able to find out where the beetles go and where they lay their eggs; and if so, an important step will be gained. If you try the kerosene emulsion, or the pyrethrum, or gas-lime and sawdust, I should be glad to learn the result [May 25, 1887].

Graptodera punctipennis injuring Nursery Stock.

I inclose you some small bugs that are eating all the leaves of my young apple and are beginning on all my young nursery stock. I think they will, if they continue, destroy my nursery. Please examine and tell me how to destroy them. They appeared about two weeks ago. I never was troubled with anything of this kind before.—[J. R. Johnson, Dallas, Tex , to H. E. Van Deman, May 10, 1887.

REPLY.—Your letter of the 10th instant addressed to Mr. Van Deman, the pomologist of this Department, has been referred by him, with the specimens, to this Division. The little green beetle injuring your young apple trees is known by the scientific name of *Graptodera punctipennis*. This insect is a near relative to the Grape-vine Flea-beetle, and its habits are very similar. The best remedy for this insect will consist in spraying your young trees with a dilute solution of Paris green or London purple. The appearance of this insect in injurious numbers is rare, and we shall be glad to hear from you further as to the amount of injury and as to the success of this remedy if you decide to apply it [May 14, 1887].

Lachnosterna hirticula injuring Poplars and Oaks.

I have several North Carolina Poplars in which have swarmed and roared, for several evenings after nightfall, myriads of beetles, samples of which I inclose.

Please inform me whether they mean evil to the Poplar and whether they or their progeny are injurious to vegetation of any sort.—[Rev. William C. Butler, Leeland, Prince George's County, Md., May 17, 1887.

REPLY.—* * * The insects which you inclose belong to one of the common May beetles (*Lachnosterna hirticula*), and are the parents of the so-called white grubs. The beetles themselves are leaf-eaters, and you will probably find that the leaves of your

North Carolina Poplars have been gnawed by them. You should not lose the opportunity to destroy these beetles, which can be done by placing a lantern suspended over a pan containing water with a thin scum of coal-oil on top near the tree. If the beetles are extremely numerous several of these trap lanterns will be necessary to destroy them. The same insects are just now damaging the Oaks upon the grounds of this Department. [May 18, 1887].

Insects Confounded with the Hessian Fly prior to the Revolution.

Du Hamel does not mention the Hessian Fly by name, but on page 90, referring to insects injurious to corn, says:

"There is a smaller kind of worm, which gets into the roots, chiefly oats, and, working upwards, destroys all the inside of the plant, which perishes soon after. I suspect it to have been an insect of this kind that destroyed so much wheat in the neighborhood of Geneva, and which M. de Chateauvieux describes thus: 'Our wheat in the month of May, 1755, sustained a loss, which even that cultivated according to the new husbandry did not escape. We found in it many little white worms, which afterwards became a chestnut color. They post themselves between the blades and eat the stems. They are usually found between the first joint and the roots. Every stalk which they attacked grew no more, but became yellow and withered. The same misfortune happened to us in the year 1732. These insects appeared about the middle of May and made such havoc that the crop was almost destroyed.' (*Verbatim et literatim* from the work of M. Du Hamel du Menceau, New Hamburg edition, 1759.)

The Angoumois Moth is also fully described by the author. If the above does not refer to the Hessian Fly it must be some closely allied pest. I have eight volumes of Arthur Young's works, but have not had the time to examine them for *flies*.—[A. S. Fuller, Ridgewood, N. J., July 16, 1888.

REPLY.—I thank you for the extracts from Du Hamel. The first indicates very plainly that it has no reference to the Hessian Fly, but the second has one expression that might apply to the Hessian Fly, viz, that about "posting themselves between the blade," but unfortunately this is more than offset by the statement of their eating the stems, and this proves with sufficient conclusiveness that it was not the Hessian Fly but a species of *Chlorops*. As you are aware these also have pale larvæ and become brown in the pupa state, while one species at least is frequently found between the blades. No, there can be no question whatever that this case refers not to the Hessian Fly but to some species of *Chlorops* or *Meromyza* or to one of the many species of insects which are known to attack small grains in a somewhat similar way. There is not a particle of positive evidence of the existence of the Hessian Fly at that early period in this country, and the reference to Du Hamel in the minutes of the American Philosophical Society, May 18, 1768, is undoubtedly to his article on the Angoumois Grain-moth. * * * [July 23, 1888.]

Injury from non-migratory Locusts in Michigan.

I will send you some grasshoppers that have destroyed all the oats about this section. What is left is worthless, as there is nothing left but the shell. I notice that the first brood is gone; they were very large. The second brood is growing fast. They had large wings, much longer than the body. * * * If they breed very fast they will clean us out. I have traveled about among the farmers on purpose to see the crops; all are much injured.

The boys say they have seen the locusts on the bushes and trees in the woods. They did not injure crops any. * * * I don't travel in the woods much. I would like to know what the seventeen-year means. Do they come every seventeen years or will they stay seventeen years?—[Anthony O'Donnell, Saint James, Manitou County, Mich., August 27, 1888.

REPLY.—The box of locusts has been received. The specimens were one female of the Red-Legged Locust, *Caloptenus femur-rubrum*, and two specimens—one male and one female—of the Two-striped Locust, *Caloptenus bivittatus*. These are both common species and widely distributed. They occasionally increase in large numbers, and, though non-migratory, often cause considerable damage to crops. The specimens you refer to as having wings a great deal longer than the body no doubt belong to another genus, probably *Acridium* or *Œdipoda*.

In regard to the Periodical Cicada, the "seventeen-year" means that they appear at intervals of seventeen years. We mail you a copy of Bulletin 8 on this insect, which will give you its history. Did they appear in large numbers in your locality? Can you send us some specimens of them? It will be very interesting to know whether the species is the true Seventeen-year Cicada or some other species. * * * [August 31, 1888.]

Australian Letter on Icerya.

* * * The insect *Icerya purchasi* we have among our orange tribe, "Citrus," and if not frequently looked after I believe would spread to a great and damaging extent; but as we have so many other pests to contend with theone in question is kept down. Just a few days before the arrival of your note we had a regular clearing all around, and my overseer killed several dozen of the Icerya, of which this one mutilated specimen can be found now, which I send you in a little cotton wool, but I think enough of it for you to identify the thing. I have not seen it on the *Acacias*, but on other plants, and particularly on our native Currant Shrub (*Leptomeria acida* R. Br.), but as I am not just now able to see or procure specimens of the insect from that plant I could not be quite certain, although I believe so. If not the same species it is very much like it. I had several interviews on the insect with other horticultural and agricultural reporters and practical men, from which I submit the following, viz, that the sugar planters first noticed the Icerya on sugar-cane imported from Singapore, but I have known it on the Citrus, especially young plants, this sixteen or eighteen years myself. * * *—[Carl H. Hartmann, Range Nursery, Toowoomba, Queensland, Australia, March 20, 1887.

NOTES.

A DESTRUCTIVE CRICKET IN LOUISIANA.

A rather remarkable insect pest has come to light the present season in Catahoula Parish, La. It is a true cricket of the genus *Gryllus*, but the specimens so far received have been too badly damaged for specific determination. Mr. Michael Dempsey, of Jena, writing under date of May 7, says: * * * "They infest portions of the hills and swamp lands alike, doing irreparable damage to cotton, sweet and Irish potatoes, peas, and tobacco. * * * Our farmers are seriously alarmed at their fearful increase and their destructive habits. Their holes in the ground are promiscuously scattered from a few inches to several feet apart, and are seldom over a foot deep in the uplands, although they go much deeper in the swamp lands, as the soil is deeper and the subsoil softer. They are seldom visible in the heat of the day, and do their cutting at night, taking all they want down into the ground, where they eat as they please. * * * In 1852 I first

noticed them eating young cotton only, and a few years back they began to eat sweet potatoes. Now they eat peas and tobacco, and have attacked our gardens. Our parish is composed of small farmers who lack means. * * We find that rapid cultivation, large gangs of poultry, and numerous birds keep them in check, but they are becoming too numerous in spite of all we can do."

Beyond doubt in a case like this the best remedy will be found in the use of a poisoned bait, and I have no doubt but that the bran, sugar, and arsenic wash, which proved so effective against the Devastating Locust in California in 1885, and which is described in my annual report for that year (Report Department of Agriculture for 1885, page 300), would prove attractive to the crickets and would accomplish the destruction of large numbers.

This mixture is usually prepared in wash-tubs or half-barrels. One of them is filled about three-fourths full of dry bran, and to this is added about 5 pounds of arsenic, which is thoroughly stirred through bran with a spade or shovel. Five pounds of sugar is next thrown into a pail, which is then filled with water, and the sugar stirred until it is dissolved, when this sugar water is added to the bran and arsenic and the three well stirred; more water is added and the stirring continued until every portion of the wash becomes thoroughly saturated. This should be placed about the infested fields in table-spoonfuls.

Freshly cut grass or other green vegetation, sprinkled with Paris green or London purple and scattered at intervals throughout the fields, will also produce good results, and be less expensive. (C. V. Riley, in *Florida Dispatch*, June 20, 1887, vol. 7, p. 576.)

A NEW ENEMY TO HONEY BEES.

Several predaceous bugs have been recorded from time to time as feeding upon honey bees, and in Bulletin 12 of this Division (page 44) we mention the fact that the common Wheel Bug (*Prionidus cristatus*) was in the habit of lurking about the hives and preying upon the bees at Winchester, Va. Last summer we received information from Mr. J. W. Lanford, of Lawrence County, S. C., that another bug had been captured by him in the act of piercing the honey bee, and that his neighbors had noticed the same insect lurking about their hives. The specimen captured in the act was forwarded to us, and proved to be *Euthyrhynchus floridanus*, a species which is rather common throughout the South.

AN UNPUBLISHED HABIT OF ALLORHINA NITIDA.

To Mr. W. W. Meech, of Vineland, N. J., the well known authority on quinces, is due the credit for the discovery that the ways of this common beetle are not altogether bad. He found the adult beetles eating the fungus *Rœstilia aurantiaca* upon his quince trees. They even alighted upon it in the basket when he was gathering the fungus and

ate it greedily. Mr. Meech says "for this meritorious service I desire they should have full credit as among the insects beneficial." This beneficial habit, however, is more than counterbalanced by their appetite for fruit, to say nothing of the damage done by the larva.

A NEW REMEDY AGAINST THE WOOLLY APPLE-LOUSE.

Maurice Maindron, in a summary of the habits of this insect, illustrated by a very handsome plate in the July number of the *Revue Horticole*, quotes the following formula from Dr. Cramoisy:

	Grams.
Pyroligneous acid rectified to 7 or 8 degrees	1,000
Salicilic acid	2
Red oxide of mercury	1
Fuchsine	.25

This solution is diluted with 30 parts of water when the vegetation is active, but is used pure in winter time. A month or two after the application of this caustic, according to Mr. Künckel d'Herculais, the old epidermis of the tree on which the eggs are found falls in powder and the bark becomes smooth, shining, and of a beautiful mahogany color.

OVIPOSITION OF THE PLUM GOUGER.

Regarding the egg-laying habits of the Wild-Plum Weevil or Plum Gouger, *Coccotorus scutellaris* [*Anthonomus prunicida* Walsh], shown at Fig. 12, while they have been described (see Walsh, First Rep. Ins. of Illinois, pp. 72–78; Riley, Third Rep. Ins., Mo., pp. 39–42), the following confirmation will prove interesting. Mr. Lawrence Bruner writes us from West Point, Nebr., under date of June 16, 1888: "I have just witnessed a female specimen of the Wild-Plum Weevil in the act of depositing an egg. The modus operandi is very simple, and requires but a minute and a half to two minutes for the performance of the entire operation. She first spreads out to their fullest extent all of her legs, braces them, and then draws her beak or rostrum to as nearly a perpendicular position as possible, then by gnawing and with a twisting motion soon works her snout into the young fruit until it is buried a trifle above the bases of the antennæ, the latter being held close against and directed upward along the rostrum upon the head while the hole is being made. She now draws out her beak and deliberately turns about, and after a few preliminary thrusts of the ovipositor inserts the latter into the hole just made with the beak and deposits a single egg that is of the same diameter as the puncture. The egg is of a dirty whitish, somewhat transparent color, and is plainly visible with an ordinary pocket lens, being uncovered and nearly flush with the surface. It soon becomes covered by the healing of the injured fruit. This curculionid does not make the semi-

FIG. 12.—Coccotorus scuttellaris. (After Riley.)

circular or lunate gash that is so characteristic of the "little Turk." It deposits a single egg in each plum attacked. But some plums examined were found to contain several eggs, several weevils having no doubt used the same plum for oviposition. When the egg has hatched and the young grub commences to bore into the fruit, a transparent, gummy substance oozes from the puncture. Fruit containing the grubs of this weevil does not necessarily fall prematurely, nor does it appear to be greatly injured for use. The mature insects from the new brood begin emerging by the time fruit commences ripening, and from that time on to late in the fall. They winter in the ground and in various sheltered localities about plum patches. In spring they appear with the first buds and blossoms, and can be jarred from the trees like their ally, the "little Turk." They cling more tightly, however, than that insect does, and a much severer jarring is required to dislodge them. Their puncturing, while not so marked as that of the other insect, begins just a very little earlier and continues perhaps somewhat later in summer."

RECENT SWARMINGS OF INSECTS.

The Reading (Pa.) *Times* for August 2, 1888, contains an account of an appearance of "bugs" in that place, with detailed remarks by a local savant (Prof. G. H. Thompson), who stated that the insects in question were "a species of a cotton bat, usually called the moth," and that "it comes from the cotton fields of the South." Who this professor is we do not know, but it is clear he is not familiar with the subject he tries to discuss. In a letter from Herman Strecker we are informed that the moth which appeared in such large numbers for the one night, August 1, was a Tortrix (*Tortrix fractivittana* Clem.). He also states that the article above referred to was on the authority of a fire-escape or lightning-rod man, who, to use Mr. Strecker's words, knew about as much of such things as an intelligent cow. The case is more correctly stated in the Reading (Pa.) *Evening Telegram* for August 2, 1888, some of the information therein being derived from Mr. Strecker himself. He also adds in his letter that "the next evening but a few were about and subsequently scarcely any." The sudden abundance of this Tortricid is certainly very extraordinary. It fluttered about the electric lights by thousands. According to a note in the Scientific American for August 18, 1888, they were first noticed flying around the lights about 8 o'clock. They soon infested the air to such an extent as to resemble at a distance a snow-storm, and passengers on the street-cars, as they passed under the lamps, were covered with the insects, which caused vast annoyance by getting into their ears, eyes, and mouths.

In the same number of the same journal Mr. Thomas Latham is responsible for the statement that myriads of moths were at date of his writing circulating around the electric lights upon Third avenue, New York. The note does not give the species, but states that the moths are barely half an inch long.

In the same number as above quoted, it is also stated that at Easton, Pa., "butterflies" by the thousands, after flying about the sixty-four electric lights, alighted on the carbons and fell dead inside the globes, two quarts of dead "butterflies" on an average being afterwards taken from each globe. It is quite possible that in this and the preceding instance the insects were the Tortrix first mentioned.

The *Rural New Yorker* for July 7, 1888, states that the Rose Beetle (*Macrodactylus subspinosus*) suddenly appeared the week previous in swarms at the Rural Grounds, causing a great deal of damage to grapes, roses, and magnolias. They were successfully combated by spraying with a Buhach solution.

AN INEXPERT DEFENSE.

The following clipping is from the Manchester (Eng.) *Courier* for July 7, 1888, and is entitled: "A remarkable charge of homicide:"

PARIS, *Thursday Night.*

The trial begins at Lyons to-morrow of M. de Villenuve, charged with homicide. M. de Villenuve is a wine-grower. Early this year eleven people died at Hyères and more than four hundred were suddenly taken ill with symptoms of poisoning. The corpses of the victims showed, at the post-mortem examination, poisoning by arsenic. M. de Villenuve, who had furnished them with wine, was charged with falsifying it with arsenic. His defense is that two years ago he employed that chemical to rid his vines of phylloxera. The insects were destroyed, but according to his theory the poison must have been absorbed by the vines, and thus poisoned the wine.

As a matter of course this defense is utterly inadmissible, and either the theory of the prosecution is correct, or an arsenical mixture must have been sprayed upon the vines at or near the time of ripening of the fruit, either as a remedy for some leaf-eating insect, or, as is more likely, for the grape-vine mildew, or perhaps for the black rot. It is not known to our chemists that arsenic is ever used as a falsifier of wine, but certain crude chemicals containing an appreciable quantity of the poison might be so used.

INSECT DAMAGE TO THE CORKS OF WINE BOTTLES.

At the monthly meeting of the Entomological Society of Belgium held May 7, 1887, Mr. Preudhomme de Borre presented a communication regarding insects which feed upon the corks of bottles in cellars, especially wine bottles. Different species eat holes through the corks, thereby causing the wines to escape. Two species (*Oenophila v-flavum* and *Rhizophagus bipustulatus*) were found in corks brought him from Burgundy. As a remedy he recommended the covering of the bottles with a hard and thick wax not subject to breaking or cracking. His closing words were: "For the love of the god Bacchus cover your bottles well, then, gentlemen." While advising this remedy he had been disposed to believe that the eggs of the insects do not pre-exist in the corks, but Dr. Tosquinet, who engaged in the discussion, announced

that he had seen several of these corks in which the wax had been bored through by the *exit*-holes of a coleopterous insect. Thus in some cases the eggs may be deposited in the cork before it is used for the bottles and escape unhurt the processes of manufacture and corkage. To escape this the bark is to be disinfected after gathering. *Tinea cloacella*, *Endrosis lacteella*, *Asopia farinalis*, and *Oniscus murarius* (a Wood-louse) were also mentioned as cork eaters. The last named attacks them probably only after they have first been attacked by insects. The idea of substituting rubber corks for bark ones was brought up but not favored, because the rubber would be apt to spoil the flavor of the wine.

LOCUSTS IN ALGERIA.

According to the *Revue Horticole* for July, 1888, the locusts are doing their principal damage in Algeria the present year in the province of Constantine. It is too early to estimate the extent of the injury, but it is said to be immense. The Government has appropriated the sum of 500,000 francs, principally as a bounty, to the most meritorious farmers. Editorially the journal goes on to say: "This is very good, but what will be equally useful is the appointing of a commission composed of distinguished entomologists and agriculturists who will study this scourge from its origin and will seek the means, if such exist, of preventing the return of these invasions."

ENEMIES OF ICERYA IN NEW ZEALAND.

In the July, 1888, number of the New Zealand Farmer a correspondent writes that he has been investigating the condition of *Icerya purchasi* in that country, and states that there is a very general impression in most districts that it has received a check from some cause not yet apparent, as the information in regard to what cause or causes can not be wholly relied upon. Another correspondent writes in the same number that he finds birds destroying this pest, gold-finches feeding constantly upon it, and paroquets being also known to eat it. In the June, 1888, number the New Zealand cuckoo is supposed to have destroyed large numbers of the scale. Vast numbers of the females on an acacia-hedge in Wairoa South were found destroyed by some natural enemy; the ova-sacs torn open, eggs gone, shreds of the cotton lying about on the ground and no larvæ to be seen, everything pointing to a bird as having been the benefactor. The evidence seemed to be in favor of the cuckoo just mentioned. This bird is said to be a visitor in New Zealand at certain seasons only, and is found in many warmer lands with a climate like that of southern California—in Australia, Tasmania, Java, and Sumatra. This matter is worth attention. Bird enemies, as well as insect enemies, should be considered when the question of introducing Icerya-destroyers into California is brought under investigation.

PERSONNEL OF THOSE ENGAGED IN GOVERNMENT ENTOMOLOGICAL WORK.

The following list embraces those now engaged in Government entomological work, and who will assist in the management of the periodical, those at Washington editorially, and the others as contributors. The force of the Division of Entomology is more or less inconstant, as it consists of both permanent and temporary employés:

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Honorary curator: C. V. Riley.
Assistant curator: John B. Smith.

☞ For bibliographical purposes it may be necessary to state that, where expedient, the names or initials of members of the force will be attached to their communications. Where initials alone are appended, the full name can be ascertained by referring to the list above given.

Editorial or unsigned articles or notes should be accredited to "Insect Life," or, where it is desired to give personal credit, to "Riley and Howard." While most of the correspondence of the Division is carried on by myself, yet much of it is also attended to by my first assistant, Mr. Howard, who acts as Entomologist in charge during my absence, and otherwise so materially assists in editorial and office work that only those articles signed by either should be considered individual.—C. V. R.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. OCTOBER, 1888.

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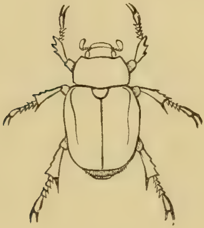
INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS, WITH THE SANCTION OF THE COMMISSIONER OF AGRICULTURE.



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SPECIAL NOTES.

As will be seen from the Extracts from Correspondence, the Chinch Bug has been very severely affected by the epidemic diseases due to micro-organisms both in Minnesota and Illinois, and, as we may safely assume, in the intervening country. This, taken in connection with the rise in the price of wheat, must be very encouraging to the Western grain-growers.

Entomology would seem to have very little connection with those most interesting of modern inventions for speech recording and repeating, as exemplified in the phonograph and graphophone. But some composition having wax as a basis has so far proved to be the best for recording the impressions of the sound waves and also for reproducing them, and this fact must necessarily enhance the value of the wax product; for we have little doubt that this improved instrument will rapidly come into general use as a substitute for stenography.

We are very glad to learn that Prof. C. H. Fernald, of Amherst, Mass., has decided to monograph the Pyralidæ, one of the most interesting families of moths; because he is one of the few really careful and conscientious workers in descriptive and monographic Lepidopterology of which the United States can boast. He excludes the Phycitidæ because they are being especially worked up by E. L. Ragonot, of Paris, who has for years been preparing his plates and diagnoses and who is a careful and conscientious worker.

The last number of *Entomologica Americana*, the organ of the Brooklyn Entomological Society, comes to us with six pages of descriptions, by Geo. D. Hulst, of Epipaschiæ and Phycitidæ. In four of these pages some eighteen new genera are defined in characteristic manner, averaging three or four lines to each characterization. Most of the new generic terms are what may be called humbug names—*i. e.*, words selected at random or coined without reference to the peculiarities of the insect, and not in conformity with best custom. In none of these generic characteri-

zations is there any information to guide the student as to wherein the genera differ from allied genera. Having in the past described a number of species in similar manner and referred them provisionally and often wrongly to various genera, Mr. Hulst takes this method of cutting the Gordian knot and saving himself trouble by making many of them types of these new genera. Such work seems to us the merest child's play. It is unworthy the dignity of science and justifies to-day the well-known stigma which Latreille, in his day, applied to a certain class of Lepidopterists.

We want a couple of young men in the work of the Entomological Division. Qualifications: Some knowledge, or at least interest, in entomology, but particularly some chemical training and mechanical ingenuity. Ability to draw and some knowledge of French and German will add to the applicant's fitness. Any one seeking such a position should correspond with the Entomologist, stating qualifications and references.

Prof. Dr. K. Lindeman, of Moscow, writes us that the larva of *Plusia gamma* has been extremely prevalent and injurious the past summer in that portion of Russia, having, in seven environments, done great damage to Linseed, Peas, and Hemp.

THE PARSNIP WEB-WORM.

(*Depressaria heracliana* De G.)

By C. V. Riley.

SYNONYMY.

? *Phalæna-Tortrix* (*Ph.-Tinea*) *heracleana* Linn.
Phalæna-Tortrix heracliana De G.
Phalæna heraclei Retzius.
? *Tinea umbellella* Fab.
? *Pyralis umbellana* Fab.
? *Pyralis heracleana* Fab.
Tinea apiella Hübner.
Depressaria heraclei Haworth.
? *Depressaria umbellarum* Haworth.
Hæmylis daucella Bouché.
Depressaria heracleana Stephens.
Hæmylis pastinacella Duponchel.
Hæmylis umbellella Zetterstedt.
Depressaria pastinacella Zeller in litt.
Hæmilis pastinacella Bruand.
Depressaria ontariella Bethune.

The first specimen of this moth which we obtained was in 1875 from Mr. H. G. Hubbard, who had found the larva in the stem of some cruciferous plant, in slight brown open cocoon, and pupæ several together in same stem. In the summer of 1883, while spending some delightful hours with Mr. Roland Thaxter, of Kittery Point, Me., we found this insect extremely common in the stems of Wild Parsnips, of rank growth and exceptional size, everywhere growing about that point. Some of

the large hollow stems from an inch to two inches in diameter would have over a dozen larvæ or pupæ within them, but no larvæ were found at the time upon the umbels. Our next experience with this insect was in 1886 on Lord Walsingham's estate at Merton Hall, Thetford, England. Here the larva was chiefly working on the umbels. We brought over with us for comparison specimens of the larvæ and imagos, and find the specimens absolutely identical with those from this country. The English specimens may be said to be slightly smaller on the average than the American, but from a series of fifty-two bred specimens now before us there is every variation between the extremes, the alar expanse ranging from 21mm to 28mm. On the average the American specimens are somewhat darker or more fuscous, but among them are a number fully as pale as the palest English specimens. We had placed *Depressaria grotella** Robinson as a variety of this species after a study of his figure and description, but Professor Fernald, who has a specimen of *grotella*, writes us that he believes the two are distinct.

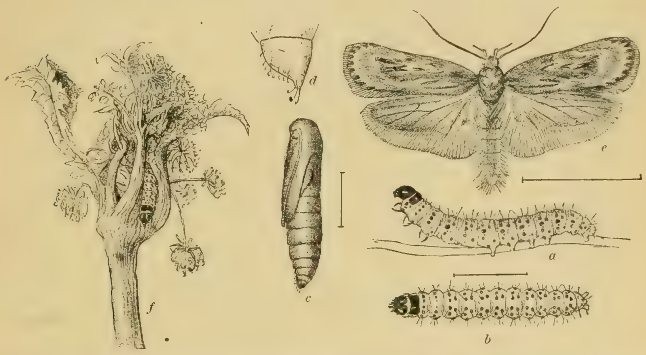

FIG. 13.—DEPRESSARIA HERACLIANA.—*a*, larva, side view; *b*, dorsal view; *c*, pupa; *d*, anal extremity of pupa showing hooks; *e*, moth—enlarged; *f*, umbel of parsnip webbed together by the larvæ, natural size (original).

EARLIER LITERATURE.

The first reliable description of the species is that given by De Geer, and must be considered the original characterization, as that of Linnaeus is very uncertain. The descriptions of Fabricius are also uncertain, and are questioned among the synonyms. Many subsequent authors have figured and described the species. Albin (1720) is said to have figured it, Reaumur (1736) imperfectly figured larva and moth, DeGeer (1752), Shäffer (1758), Hübner (1805–24), Duponchel (1836), Herrich-Shäffer (1855), and Zeller (1854) have figured the wings, while J. Sepp (1843) has given an excellent plate of all stages excepting the egg. Bruand

* Lepidopt. Miscellanies. Ann. Lyc. Nat. Hist. N. Y., vol. 9, 1870, pp. 157, 158, pl. 1, *f*, 10.

(1844) figures larva and pupa, Curtis (1860) figures larva and pupa, and Stainton (1861) figures larva and adult.

THE SPECIES IMPORTED FROM EUROPE.

The Rev. C. J. S. Bethune (Can. Entom., vol. 2, No. 1, Aug., 1869, pp. 1–4) describes specimens taken in Ontario as *Depressaria ontariella* n. sp. On p. 19 of the same volume, in connection with a note on the subject by Mr. James Angus, of West Farms, N. Y., some doubt is expressed as to the validity of the new species. In his Beiträg. z. Kennt. d. nordam. Nachtfalter, Zeller (Verhandl. d. zool.-bot. Gesellschaft in Wien, Band 23, 1873, pp. 235–236) refers to two females under the name of *ontariella* Bethune (hence, of course, from Canada or the United States), one having label "14 Aug.," received through Dr. Speyer, which agreed in the most exact manner with large European specimens of *heracliana.* Zeller adds that without doubt the species emigrated to America; and having reached land after a happy winter passage experienced no difficulty in selecting at once a suitable food-plant for its progeny. Soon after this Prof. J. A. Lintner (Canad. Entom., vol. 5, p. 82) records that a specimen of *D. ontariella* Bethune, sent by him the previous fall to Dr. Speyer, and by him submitted to Zeller, was by the latter determined to be *D. heracliana.* We have also from William Saunders, now director of the Dominion Experimental Farms, an authoritative specimen of *ontariella* which is a true *heracliana.*

HABITS AND NATURAL HISTORY.

Stainton says that the eggs are deposited in the spring by the hybernated female moth upon the undeveloped umbels of the Parsnip (*Pastinaca sativa*). The larvæ may be found here in the United States in the month of June; in England toward the last of June and through July. They web the flower-heads together until these are contracted into masses of web and excrement, an umbel thus affected being shown in fig. 13, *f.* After the larvæ have consumed the flowers and unripe seeds and become nearly full grown, they enter the hollow stems of the plants by burrowing their way inside, generally at the axils of the leaves, and then feed upon the soft white lining of the interior. Here, inside the hollow stem, they change to the pupa state. The larvæ are moderately gregarious. They will sometimes eat newly-sown parsnip, after the older plants originally attacked have been destroyed, in such cases eating the tender green leaves, while of the older plants they eat only the flower-heads and interior lining of the stems. It is not at present known whether there are two broods, though this is quite probable.

On June 4 of the present year we received from the noted seedsmen D. Landreth & Sons, Bristol, Pa., flower-heads of the parsnip badly infested with the larvæ, accompanied by the following account of injury:

We send you some further specimens of parsnip seed-stalks suffering under the attack of the grub referred to in our previous letter.

This larva, if it attacked only the extended foot-stalks of the seed-heads might be treated, but it secretes itself as well within all the folds and enveloped spaces of the seed-stalk, parts that can not be reached except by unfolding.

We have treated the affected plants with kerosene emulsion, whale-oil soap, dry Paris green, Paris green in water, per-oxide of silicate, and other articles, and all to no effect.

No parsnips being at hand to feed the larvæ upon, a lot of flower-heads of the Wild Carrot (*Daucus carota*) were placed in the breeding cage with them. After a short interval large numbers of the larvæ gathered around the cut ends of the stems and began feeding thereon. They were noticed, also, to be cannibalistic in their habits, several being seen to attack one of their number and devour it in a very short time. They did not like the flowers of the Carrot, but bored into the stems. On the 15th of June more larvæ were received, the umbels infested by them being completely spun together so that they could not expand, and the greater part having become brown and decayed. In a few instances the larvæ had entered the stem.

On the 14th of June a few of the larvæ changed to pupæ in the midst of large masses of excrement. On the 18th about a dozen more pupated, some at the bottom of the jar and others on the flower-heads or any other part of the plant, while others still pupated between the folds of blotting-paper placed purposely at the bottom of the jar; all inclosed in a slight web. On examining the stems of the Carrot, July 12, on which they had fed, it was found that several had entered to undergo their transformations.

According to Bethune the species remains from 11 days to 2 weeks in the pupa state, in Canada beginning to appear about the 1st of August. Stainton gives the length of time passed in the pupa state in England as 3 to 4 weeks.

The moths which we reared in 1883 issued between July 30 and August 4; those from Mr. Landreth the present year issued from June 25 to July 10. They have the habit of creeping into the crevices of the soil, and are then not easily detected.

DESCRIPTIVE.

De Geer first described both the larva and the moth in part 1, volume 2, of the Mémoires. A brief but good description of both is also given by Stainton in the Tineina, while Bethune has fully described the larva, pupa, and imago under the name of *ontariella*.

No description of the egg of this species has been published, and we have not yet obtained specimens.

The larva (Fig. 13, *a* and *b*) varies in general color from a light yellowish or greenish to a bluish-gray, and has conspicuous black piliferous spots normally placed, the head and cervical shield being black. Its average length when full grown is 12 millimeters.

The pupa (Fig. 13, *c*) is dark brown, unarmed and normal, and is inclosed in a slight silken cocoon inside the hollow stem of the plant.

The moth (Fig. 13, *e*) is of a grayish-buff or pale ochreous, with fuscous markings on front wings.

GEOGRAPHICAL DISTRIBUTION.

This species is probably one of the most generally distributed of the genus. It is recorded by Herrich-Schäffer from Glogau, Dresden, Sweden, and England. Stainton adds Scotland, Ireland, France, Finland, and Canada. It is also now well seated in the Eastern United States.

FOOD PLANTS.

In Europe, the Cow Parsnip (*Heracleum sphondylium*), Cultivated Parsnip (*Pastinaca sativa*), Siberian Parsnip (*Heracleum sibiricum*); in America, *Pastinaca sativa* and the Wild Carrot (*Daucus carota*) are known to be subject to its attacks.

ENEMIES.

Kaltenbach (Pflanzenfeinde, p. 282) says that according to Boie, of Kiel, its natural enemies are *Cryptus flagitator* Grv., *Pimpla heraclei*, and *Hoplismenus dimidiatus*, which he found in the roots, together with the pupa cases of the moth. Curtis (Farm Insects, p. 414) records *Cryptus* (*Phygadeuon*) *profligator* Grv., and *Ophion* (*Pristomerus*) *vulnerator* Grv. as bred from the larvæ by Bouché. He also records his own breeding, from a single larva taken from the parsnip, of a female *Microgaster* allied to *lacteipennis*, and about thirty females of *Encyrtus truncatellus*, which he believes were parasitic on the *Microgaster*. In this conclusion he is doubtless in error, as *Encyrtus truncatellus* (= *Copidosoma truncatellum* Dalm.) is always, so far as known, a primary parasite of Lepidopterous larvæ. It already inhabits this country, and may probably turn up as a parasite of this particular Depressaria.

No parasites were bred by Bethune in this country, nor by us. Among the birds, however, Bethune states that the Hairy Woodpecker, (*Picus villosus*) visited the parsnip-stalks in his garden daily, and pecked away at the larvæ and pupæ within.

REMEDIES.

Bethune suggests as a remedy that, when the young caterpillars appear on the flowers, the umbels may be dusted over with powdered white hellebore, repeating the operation occasionally. We doubt the efficacy of this, and should have more faith in the arsenites, notwithstanding Mr. Landreth's adverse experience. Should the flowers be destroyed before they are noticed, cut off and burn all affected stalks before the moths emerge from the pupæ. The larvæ are easily disturbed, and may be dislodged from the umbels and collected in pans and burned.

NOTES ON A SIMULIUM COMMON AT ITHACA, N. Y.*

By L. O. Howard.

Prof. J. H. Comstock has been studying for some time a Black Fly which occurs in its earlier stages in enormous numbers in and about the streams at the head of Cayuga Lake, and which may or may not be identical with the species studied by Dr. W. S. Barnard, and which he treated in 1880 in the third volume of the American Entomologist. I am of of the opinion that it will prove to differ on account of differences in the manner of oviposition. Dr. Barnard's species was studied at Buttermilk Creek, 3 miles south of Ithaca, while the species observed by Professor Comstock inhabits the Cascadilla and Ithaca gorges, both of which are on the north side of the city.

As a boy I was familiar with the large black slimy masses of larvæ attached to the rocky bottom of the Cascadilla, as, indeed, what Ithaca boy was not. We all avoided them as if they had been poisonous, and called them "Blood-suckers," and every one of us firmly believed that he would be a "goner" if he accidentally stepped upon a clump while bathing. Their true nature was not known until well along in the seventies, when Professor Comstock discovered their real affinities. The old name and the old superstition, however, still clings to them among the youthful bathers in these streams.

To-day (September 2, 1888) I have just taken a walk through the Ithaca gorge in company with Professor Comstock and have been much interested in observing these insects after having studied *Simulium venustum* at Washington, and being familiar with the collected specimens, in all stages, of *S. meridionale* and *S. pecuarum* studied by Professor Riley from Arkansas and Mississippi, and described by him in his 1886 report. There had evidently been a comparatively sudden fall in the water, and we were enabled to make our observations dry shod. Many patches of larvæ were left high and dry, and were wriggling and dying, in glistening masses, under the hot rays of the sun. The bottom of the stream is solid rock into which many small pot-holes have been worn, and some of these holes were still filled with water, making miniature aquaria, which seemed teeming with animal life like the tide pools on the sea-coast. Simulium larvæ of all sizes were found in these pools, and with them the larvæ of Ephemerids, of *Sialis*, of *Hydropsyche*, and others which we did not recognize. One large green Phryganid larva, with two tripartite anal hooked processes was observed destroying one of the Simulium larvæ.

* This article was sent in as a field note while making a brief sojourn at Ithaca, with the hope that it would arrive in time for the September number. It was too late, however, and is published in this number without further elaboration, which would take more time than I can just now spare.—L. O. H.

The full-grown larvæ of the Simulium are the largest I have ever seen. Specimens were taken which were afterwards measured and found to be between three-fourths and seven-eighths of an inch long. The anal swelling is very pronounced. Those colonies which were left by the receding water seemed to make no effort to escape but probably died on the spot to which they were attached. A gradation in the size of the larvæ from the borders of the stream to the center was observed, as already noticed by Dr. Barnard. The cocoons were found here and there, but apparently usually a little distance away from the masses of larvæ. The cocoons appeared to me exceptionally large and tough. The colonies of larvæ were found in greatest numbers just on the verge of the numerous falls where the water was shallow and swift, and at the crown of these falls I was delighted to have Professor Comstock point out to me the adult insects. They were hovering in the bright sunlight in considerable numbers, and a number were captured with a net. They could hardly be said to fly in swarms, but seemed to hover about, each one independent of the others, but remaining in about the same locality. At this time of the year they seemed to be principally males, as of the fifty specimens captured but one was a female.

Professor Comstock tells me that this same flight of the adults can be observed on almost any day through the summer, and that he has seen them as early as June. During July he states that he observed them flying in enormous numbers. His notes upon the oviposition of the species will be very interesting when published. It will be remembered that Dr. Barnard observed the eggs at Buttermilk ravine at the edge of the steam *above the water*. Professor Comstock, however, has seen the female dart at the crown of the falls after a preliminary hover and lay her eggs in the swift current. He states that a number of females choose the same place for oviposition and frequently lay a mass of eggs as large as the palm of one's hand, which accounts for the large extent of the colonies of larvæ. I have seen these larvæ in patches of many feet in length and so close to each other that the surface of the rock could not be seen. The jet black color of the larvæ is striking, and the colonies can be readily seen from a considerable distance.

A peculiar fact concerning this species is that it *does not seem to bite.* No one, so far as I know, has ever been bitten by a Black Fly in this vicinity. A comparative examination of the mouth-parts of this and other species will therefore be interesting. The males are very beautiful, as are individuals of this sex in other species of the genus. The eyes in life are of a beautiful golden bronze, the body is covered with a silvery pubescence and the wings are highly iridescent.

The exact details of the life history of this species are being collected by Professor Comstock, and we look forward to their publication with much interest.

I called attention three years ago to the abundance of the nets and tubes of *Hydropsyche* upon the Simulium-covered rocks in Rock Creek

at Washington, and I was pleased to find the same condition of affairs here at Ithaca. The cases of these carnivorous larvæ were very numerous, as was to be expected from the abundance of food. The nets differed from those found at Washington and the species is probably different.

A LADY-BIRD PARASITE.

By C. V. Riley.

Up to the present time no parasites of adult Coccinellidæ have been recorded in this country, although *Homalotylus obscurus* Howard has been reared from the larvæ of the Convergent Lady-bird (*Hippodamia convergens*) in Florida by Mr. H. G. Hubbard.* European entomologists, however, have recorded several observations of this character, and we have long known of the occurrence of at least one parasite in the United States (the species here treated) having habits similar to those described by Westwood, Ratzeburg, and others.

In 1879, at North Bend, Ohio, while visiting our esteemed friend, the late Dr. John A. Warder, we found one specimen of the Spotted Ladybird (*Megilla maculata*), stationed almost motionless, though still alive, over a tough brown silken cocoon in the position shown at Fig. 14. We had previously, in Missouri, found the same Coccinellid dead and fastened in a similar manner over an empty cocoon, but looking so natural that until dissected and found to be gutted, it was difficult to realize that it had been parasitized. No flies were obtained from the specimens.

Fig. 14.—Megilla maculata. Beetle and cocoon of parasite, enlarged (original).

In July, 1883, according to our notes, Mr. Howard observed the same thing at Sheldrake, N. Y., but made the mistake of attempting to observe it from day to day in the field without disturbing it, and one day the leaf of corn to which the specimen was attached was missing. In 1884 a number of similar specimens were found at Washington by Mr. Pergande, and at Oxford, Ind., by Mr. Webster, and these were carefully studied and a number of the adult parasites reared.

The cocoons and the parasitized beetles were found upon a number of different plants, but usually upon cereals. The beetles in all these later cases were at first alive, and several of them lived for twelve days after they were found. All were unable to leave the cocoons, and when forcibly detached were unable to walk, rolling over upon their backs on making the attempt. The closest examination of the beetles found attached to the cocoons failed to show any exit-hole by which the

* See Bull. 5, Division of Entomology, p. 22, and Insects affecting the Orange, Hubbard, p. 70.

parasitic larva emerged prior to spinning, although it seemed probable that the ventral portion of the thoracico-abdominal suture was used for this purpose. Mr. William H. Patton, who has also found this parasite on *Megilla maculata*, informed us in 1881 that in his specimen the larva had apparently emerged form a perforation in the last dorsal segment of the abdomen.

A number of free specimens of the Spotted Lady-bird were captured August 24, for purposes of comparison, and in one individual which could not be distinguished from the others in size, coloration, *or activity* was found a larva which was with little doubt that of the same parasite. This larva was apparently full-grown, as it filled the cavity of the abdomen completely. Its head was directed towards the suture between the abdomen and the metathorax, thus strengthening the probability that this is the point of exit.

In addition to the numerous specimens of *Megilla maculata* found thus parasitized at Washington, one specimen of *Coccinella 9-punctata* was also found which had evidently been infested by the same parasite.

Mr. Webster's observations and his efforts, at our request, to ascertain the point of exit of the parasitic larva from the beetle are summed up in a letter dated Oxford, Ind., July 22, 1884, and from which we quote:

I am sorry to say that with my present knowledge I am unable to settle the Lady-bird parasite matter to my satisfaction. I have had five examples, only one of which (*a*) was placed in alcohol when found. This had sufficient vitality left to tear itself from the meshes of the cocoon. From this I think the parasite escaped by way of the aperture in the membrane connecting the thorax with the abdomen, which you can readily see. Three of the others were dried and difficult to study, none, however, exhibiting the aperture as in (*a*). In one the mouth was seriously damaged; in the other two not. These two were very brittle and, although there were apertures above in the vicinity of the scutellum and bases of the wings, I do not like to attribute to the parasite what might have been done by Webster.

The adult insect was bred in some numbers both from Washington and from Indiana specimens. Only females, however, were reared. No observations have yet been made on the mode of oviposition. Reference to the literature of European parasites of Coccinellidæ shows that the so-called *Microctonus terminatus* (Nees) has precisely similar habits, and under the supposition that the American species might be a *Microctonus*, specimens were sent to Mr. E. A. Fitch, of England, through Mr. J. B. Bridgman, for comparison with identified species in England. Through an oversight, Mr. Fitch did not notice that the species did not belong to *Microctonus*, and very naturally answered Mr. Bridgman that it did not correspond with any of Ruthe's types of this genus.

Subsequent study indicates that the species bred by us may probably be placed in the Braconid genus *Centistes* of Haliday, judging from Haliday's original description and the few words of analytic diagnosis contributed by Rev. T. A. Marshall to Mr. Cresson's synopsis of the Hymenoptera of North America.

Awaiting the forthcoming consideration of this genus in Mr. Marshall's Monograph of the British Braconidæ, however, we shall not attempt its characterization at present, but would simply propose for it the provisional name of *Centistes americana.*

The so-called *Microctonus terminatus* reared by Audouin, Ratzeburg, and Scheffer from Coccinella spp. proves, likewise, to be no *Microctonus* but to belong to the well-known genus *Perilitus.* (See Kirchner's Catalogus Hymenopterorum Europæ, and Marshall's Monogr. Brit., Bracon., Trans. Lond. Ent. Soc. 1887, Part II, p. 53.)

The parasitic habits of *Microctonus* proper are not known. All of the subfamily of the Braconidæ Polymorphi to which it belongs, viz, the Euphorinæ, are however, Coleopterous parasites in Europe so far as known.

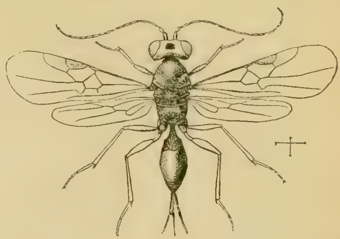

FIG. 15.—CENTISTES AMERICANA. Imago, enlarged (original).

Ratzeburg's interesting account of the habits of *P. terminatus* (Nees) indicates that it works in a manner almost precisely similar to our American parasite and we therefore print a translation of his account:

In 1850 I bred three females, all being found in very strange situations in the vicinity of Neustadt: Living specimens of Coccinella 5-punctata, and C. 7-punctata were sitting or hanging (once in a rolled-up leaf) on shrubs and carried under the abdomen a gray, pear-shaped, subtransparent cocoon surrounded with loose silken threads. From the fact that the Coccinella clasped the cocoon with the legs and got thus entangled in the silk, the cocoon was closely applied to the abdomen, and I had some trouble in detaching the cocoon when the Ichneumons (from June 10-14) had hatched after cutting open the cocoon. Two Coccinellæ were still alive as long as the cocoon was still unopened, since they moved their legs a little, but died after the Ichneumon flies had issued. The third specimen, however, remained living for a long time afterwards and even could place its legs into the proper position and remain standing. I have not been able to perceive the wound through which the Ichneumon larva issues from the beetle. However, the Microctonus larva surely feeds within the Coccinella (as already stated by Westwood) and it is probably through one of the ligaments, which later closes up again, that the larva pierces through the beetle. I come to this conclusion; first, I found upon dissection of a recently dead Coccinella that all intestines were shriveled up and pressed onto the walls; secondly, I have observed the sting by which the Ichneumon Fly deposits the egg.

To a lively female Microctonus, which I had kept alone for two days in a glass box, I placed a Coccinella 7-punctata. At once the attention of the Microctonus was aroused; she ran to the place where the Coccinella was and closely examined it from all sides, running forward and backward in a very comical way. Immediately afterwards she prepared to sting in the same way as described by me in Aphidius aphidivorus (I, p. 50). The abdomen, pear-shaped in repose, became long and thin; the ovipositor protruded more, only on the tip surrounded and conducted by the sheats. The sting was repeated about six to ten times in one minute and always directed against the incisures of the body (usually of the abdomen). Within one hour the female thus attacked three or four times the beetle, which only occasionally moved. Since the Ichneumon ♀ was not impregnated I could not expect to get any progeny.

In 1842 (June 10) I had already found one specimen pursuing a Coccinella. Wesmael also captured it in the middle of June and Nees in October (I, 30).

We have here also an Ichneumon Fly which oviposits in imagos, but imagos which are long-lived and in which the brood can mature (Westwood, Introd. II, p. 143, and Forstinsecten III, 18).

Within two days the Ichneumon Fly repeated its stings very often. It died then and shortly afterwards also the Coccinella.—[Ratzeburg, Ichneumonen d. Forstinsecten, Vol. III, pp. 61, 62.]

THE PURSLANE CATERPILLAR.

(Larva of *Copidryas gloveri*, Grote & Robinson.)

In August, 1879, we received larvæ of this insect from Columbus, Tex., where they were found by Mr. Schwarz in tolerable abundance feeding upon the common Purslane (*Portulaca oleracea*) in company with larvæ of *Deilephila lineata* which so commonly feeds upon this plant.

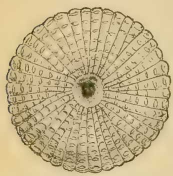

FIG. 16.—COPIDRYAS GLOVERI. Egg, greatly enlarged.

We did not receive them again until the summer of 1887, when they were sent to us by several correspondents in Kansas and Nebraska, who stated that they occurred in such great numbers upon the Purslane that they could not but anticipate great damage to field crops after the original food-plant should give out. As a sample communication we may quote from Mr. H. W. Lipp, of Rossville, Kans., who wrote us under date of August 22:

"Inclosed please find a few larvæ, and if not asking too much will you be kind enough to inform me to what order and family they belong? They have appeared here for the first time, and do no damage to crops just now. * * * Up to date they are feeding on purslane and nothing else, and the oldest and largest ones are commencing to go into the ground. To all appearances they are going to stay with us, and for that reason I would like to know if they are liable to attack growing corn next spring or no. They are here in very large numbers and some alarm is felt as to what they will feed on next spring. * * *

FIG. 17.—COPIDRYAS GLOVERI. Newly-hatched larva, greatly enlarged.

We reared a number of adults in 1887, and had intended publishing an account of the insect that year, but Prof. E. A. Popenoe, of Manhattan, Kans., who had the advantage of being actually on the ground, published so good an article in the Kansas *Industrialist* for October 1, illustrated by figures drawn by Mr. C. L. Marlatt, that the immediate necessity was overcome, especially as Professor Popenoe's paper was quite widely quoted. The facts, however, should be put upon more permanent record and hence this note. The accompanying figures of larva and moth were engraved several years ago, while the figures of the egg, pupa, and cocoon are copied from Mr. Marlatt's figures.

The following facts concerning the life history of the species are condensed from our own notes and Prof. Popenoe's paper:

FIG. 18.—COPIDRYAS GLOVERI. Cocoon inclosing pupa, natural size.

The eggs (fig. 16) are laid on the under side of the purslane leaf, either singly or in clusters of from two to five. The larva hatches in two or three days (fig. 17 young larva), and is at first light green or yellowish green with darker shading across the middle of the body. In eight or nine days it attains full growth after having passed through four molts. The full-grown larva (fig. 20, *b*) is light gray or dull white with black dashes on the sides of each segment, and with the shadings of salmon pink.

The full-grown larvæ enter the ground for pupation, excavating a tubular burrow in the surface soil, gumming the lining and closing the opening with a thin layer of particles of soil (fig. 18). The pupa is shown at fig. 19 with the head and anal extremities enlarged. The insect remains in this state in the neighborhood of twelve days. The moth is shown at fig. 20, *a*, and the colors of the front wings are brownish-gray, with a creamy white streak, those of the hind wings buff with a blackish margin.

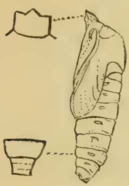

FIG. 19.—COPIDRYAS GLOVERI. Pupa, with head and anal extremities enlarged.

Four generations were traced by Professor Popenoe, but he does not report upon the method of hibernation.

Glover figures the female in his plate 85, fig. 34, and states that it was the only specimen in a small collection by Dr. Lincecum, of Texas. This formed the type of the species, and the male was then unknown.

There is little danger that this insect will ever transfer its attentions to any cultivated crop, although the cultivated *Portulaca grandiflora* may suffer in the future. The insect may be looked upon rather as beneficial, in that it destroys the noxious "Pussley," the supposed evil qualities of which Charles Dudley Warner has made so celebrated in his "My Summer in a Garden." Purslane is, however, not looked upon by our Western farmers as a particularly noxious weed, and following the locust ravages of 1875 it proved almost a godsend by its rapid development and value both as food for hogs and as a green manure when plowed under.

FIG. 20.—COPIDRYAS GLOVERI. *a*, adult; *b*, full-grown larva, natural size (original).

The species was originally described from the female (Tr. Am. Ent. Soc. II, 185) under the genus *Euscirrhopterus.* Subsequently Mr. Grote (*Can. Ent.* VIII, 99) referred it to *Copidryas*, and described the male from a specimen from Mr. Meske (now in our possession), separating the form from the Cuban *Euscirrhopterus freyi.* Butler (*Papilio* I, 129) compares the genus to *Ægocera*, but adds nothing to the description. Strecker (Lep. Rhop. et Het., 1877, 132) describes the larva from a blown specimen, and this is the first description of the larva made, though no food-plant is given. Of the seven specimens before us (4 ♀ ♀, 3 ♂ ♂) the males are uniformally smaller, and have the clypeal projection smaller and narrower, and covered with whitish, intermixed with a few blackish, scales, whereas in the female these scales are black. A second and less important character of the male is the tendency in the outer discal spot of primaries inferiorly to elongate and become double. The colorational differences mentioned by Grote have no sexual value.

FURTHER CONCERNING EXTERNAL SPIDER PARASITES.

By L. O. Howard.

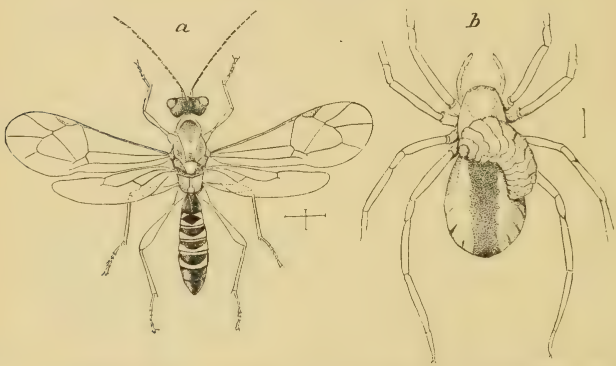

Fig. 21.—*a*, Polysphincta dictynæ, adult; *b*, Linyphia communis with its parasitic larva—enlarged (original).

After reading my note on this subject in the August number of Insect Life (p. 42), Mr. J. H. Emerton, of Cambridge, wrote me that he had sent me, among other hymenopterous parasites of spiders, several similar larvæ, and that he found such instances almost every year.

Upon looking over Mr. Emerton's material, which I had not previously carefully examined, I found five small spiders, four of which supported externally upon the dorsum of the abdomen parasitic larvæ and one a delicate cocoon from which a parasitic larva had been taken. The spiders seemed to be *Linyphia communis*, *L. marginata*, and a species of *Erigone*.

In another vial I was delighted to find an adult parasite, the cocoon from which it had emerged, and the remains of the spider which had supported it. Concerning this specimen, Mr. Emerton had made the following note:

Fly raised from larva on young *Dictyna volupis* Keys. The remains of the spider and the pupa cocoon are in the vial. When found, May 15, 1887, the larva was about half as long as the spider's abdomen and about one-fourth as thick. It was attached by the mouth on the front of the abdomen. By May 18 the spider had died and the larva was full grown, larger than the spider had been, and had begun to spin a cocoon. May 25 it changed to pupa and the fly came out June 1.

The adult parasite is a beautiful little *Polysphincta* ♂, and differs from other described North American species.

Polysphincta dictynæ n. sp.

Male.—Length, 2.5^{mm}. Face obscurely carinate below insertion of antennæ; mesonotum shining, but with short, fine, and close pubescence; metascutum with two submedian longitudinal carinæ extending parallel to the nucha when they diverge; nucha smooth, circular, rest of metascutum faintly shagreened. First abdominal segment with a well-marked smooth central longitudinal dorsal groove, sides of groove concave; venter of abdomen strongly concave; wing veins all light brown; no trace of an areolet. Color: Vertex and occiput black, face lemon yellow; antennal scape, pedicel, and joints 1 and 2 of funicle yellow, rest of funicle brown; mesothorax yellow with a large brown spot at front of scutum and one on each of the parapsides, also one just anterior to scuto-scutellar furrow; metathorax black; all legs yellow; abdomen honey-yellow below, segments 1, 6, and 7 brown above, remaining segments yellow, each with a definitely limited brown patch which is diamond-shaped on joint 2 and triangular on 3, 4, and 5.

1 ♂, from *Dictyna volupis;* J. H. Emerton, Cambridge, Mass.

The figures illustrating this note have been drawn by Miss Sullivan from the material received from Mr. Emerton. Fig. 21, *a*, represents the adult *Polysphincta dictynæ*, and Fig. 21, *b*, an outline drawing of *Linyphia communis* with a parasitic larva in situ. The larva figured is full grown and is quite apt to be that of the Polysphincta. No attempt has been made in this sketch to show more than the position which the parasitic larva assumes on the spider.

REMARKS ON THE HESSIAN FLY.*

At the meeting of the American Philosophical Society, May 4, the author called attention to some grave errors in the published minutes of the earlier meetings of the society. The public, as well as the most competent authors, had always believed that the Hessian Fly was introduced during the Revolution by Hessian troops. Dr. H. A. Hagen, of Cambridge, has argued against this belief. He has argued, further, that the species was not imported from Europe. Professor Riley showed that most of Hagen's arguments were weak and fell to the

* Abstract of a paper by C. V. Riley before the Society for the Promotion of Agricultural Science, Cleveland, Ohio, August 21, 1888.

ground, except that based on the early minutes of the Philosophical Society, which, as communicated to him (Hagen) by one of the secretaries, Mr. H. Phillips, jr., and as published, make mention of the Hessian Fly in 1768, or before any Hessian troops landed. Professor Riley announced that the statement of the secretary, as also the published minutes, turn out to be absolutely erroneous on these points, as, upon consulting the original records, he found no mention of Hessian Fly prior to 1791. In all previous cases *the Fly* or *the Fly in wheat*, or *the Fly-weavil* are the terms used, and it is susceptible of positive proof that these terms referred to totally distinct insects, belonging to different orders, and still called weevils, viz: *Sitophilus granarius*, *S. oryzæ*, and *Gelechia cerealella*. Thus popular belief and tradition are vindicated, but it is a most interesting illustration of grave and misleading error, resulting from inaccuracy in what appear to be trifles, as the change in the records was doubtless made inadvertently.

The following extract is from the letters to Dr. Hagen by Mr. Phillips:

At the request of Professor Lesley, I have examined our old minutes in reference to the Hessian Fly, and append on next page the results of my search. I know *positively* that before the Revolution our newspapers were full of communications in reference to the Hessian Fly *eo nomine*. I can not call to mind any one paper, but I remember perfectly frequently seeing these articles when reading for other purposes. I can not find that the committee ever reported.

The following are the extracts from the minutes as furnished by Mr. Phillips:

May 18, 1768.—Com. on Husbandry, to consider whether any method can be fallen upon for preventing the damage done to wheat by the Hessian Fly. [N. B.—Mr. Du Hamel has written on the subject.]

June 21, 1768.—Papers on the Hessian Fly read by Dr. Bond, ordered to be published. [See No. 4, original papers.]

October 18, 1768.—Col. Landon Carter, Sabine Hill, Virginia, observations on the Fly Weevil destructive to wheat; ordered to be published.

For purpose of comparison the following verbatim copy of the records is here reproduced:

May 18, 1768.—It was recommended to the Committee of Husbandry, etc., to meet on Tuesday, 31st of this month, at the college to consider whether any method can be fallen on for preventing the damage done to wheat by what is called the fly. [N. B.—Monsieur du Hamel has written on this subject.]

June 21, 1768.—The Committee for Husbandry report that they had considered ye affair of destroying the Fly in wheat, and that Dr. Bond had laid before them a paper containing many useful observations on that subject, which Dr. Bond was requested to read before ye Society. The Society having heard and approved of ye paper, request him to prepare it for ye press, that it may be communicated to ye public without loss of time.

November 15, 1768.—Colonel Lee transmitted to the Society the ingenious and accurate observation of Col. Landon Carter, of Sabine Hall, in Virginia, concerning the *Fly-weavil* that destroys the *wheat*. The Society acknowledge themselves under great obligations to Colonel Carter for communication of the conclusions he has formed (on long experience) concerning that insect's propagation and progress, and the methods to be used to prevent the destruction of the wheat by it, and order it to be printed for the public benefit.

EXTRACTS FROM CORRESPONDENCE.

A Stomoxys Injuring Stock in Oregon.

What is the name of this fly? It made its appearance here two or three years ago, and this year pesters our horses fearfully. Is there any application to the hide or coat of the horse that will keep them off?—[J. H. Albert, Salem, Oregon, June 29, 1888.

REPLY.— * * * This fly proves to be a species of the genus *Stomoxys*, and is so close to the Eastern species *calcitrans*, that I hardly care to separate them, especially as your specimen was flattened and broken. *S. calcitrans* is a well-known biting fly in the United States, seldom entering houses just before or during a rain, and its close resemblance to a common house-fly has given rise to the supposition that the house-fly bites only in wet weather. The species are seldom abundant enough to cause any injury to stock, although the present spring we have had accounts from Maryland and New Jersey of considerable annoyance caused to cattle by them. We have found that fish-oil is the most admirable preparation to protect stock from the bites of this fly and from the Buffalo Gnat. A reliable correspondent of ours states that in the absence of fish-oil he uses tallow with sufficient pine tar added to make it stick the hair together but not enough to make it cause the hair to fall off.—[July 10, 1888.]

The Colorado Potato-beetle in Nova Scotia.

* * * I wish to make known to your Department the interesting (not to farmers) fact that the Colorado potato-bug is now common in certain parts of Nova Scotia, in which province it became introduced about six years ago.

In this particular locality I visited in fields two days ago and found it covered with the young. Would you like specimens? I should be happy to forward them.—[J. Matthew Jones, Aylesford, Nova Scotia, July 14, 1888.

REPLY.— * * * Your statement in regard to the Colorado Potato-beetle is very interesting indeed as I believe we have no published record of this fact. We have for some time wished to secure specimens of this insect from its extreme northern range in order to make notes as to variation, and have also wished to receive notes from some good observer as to the life history in such localities, including particularly the number of broods, duration of the different stages, etc. * * * —[July 24, 1888.]

1888 Damage by Chinch Bug in Missouri.

* * * In your favor of July 2 is the query, "Are the Chinch Bugs really doing any damage in this vicinity, or have the rains killed them off?" They have and are doing considerable damage, but the excessive rains of this season have checked their multiplication considerably, I think, and also enabled the infested crops to make a strong growth and better resist the pumping operations of the insects. I am afraid yet as the weather gets drier and hotter that the maize and millet crops will be very much damaged. I was horrified yesterday to see the bugs swarming around the roots and stems of the grass in a timothy meadow. They were running back and forth over the ground like excited ants when their nests are disturbed.

Since writing the above I have been through some fields of maize, oats, sorghum cane, and millet, and the sight of the state of all these crops (though they were all doing well two weeks ago) was enough to "make the heart sick." It is hard to say which of the above crops has suffered already the most, though sorghum cane has been "cracked up" to be nearly bug-proof. The cause of all this quick devastation is apparently through there having been seven or eight days of hot, dry weather, which has enabled the bugs to "multiply and replenish the earth" and get in their work.

On the ground, running in a restless, excited manner among the roots of all the crops mentioned, the bugs are to be seen by thousands, as if they had been let loose on

the earth like a new Egyptian plague. They seem to be actuated by the same principle as "She," in Haggard's novel, and intend to "Blast" their way to success. If any one wishes to live here by farming the whole present system will have to be revised, a complete change of crops will have to be made. Clover and a variety of root crops will have to be grown. I did hope that by putting down most of our land in timothy meadows we might evade the bugs, but it seems now that they will damage timothy as bad as any other of the grass family; especially so would it be if the cereals and other grasses were not to be had.

The Chinch Bug is too prolific and omnivorous to be vanquished by any other mothod than starvation.—[J. G. Barlow, Cadet, Mo., July 9, 1888.

A problematical remedy against the Asparagus Beetle.

Asparagus beetle.—Last year I had very great numbers of them on my field. In October, after several killing frosts, I found hundreds of them on a few small plants which had escaped. All summer I fought them with Paris green. Being frightened by the great numbers seen as late as October, this spring I opened furrows on each side of the rows and placed a little more than half a ton of tobacco stems in those rows, closing them again with a plow. The two acres and one-third were disposed in four beds of twelve each, with a road 10 feet wide between every two beds, leaving for for the fifth bed only five rows. There was no tobacco placed in the roads. This spring I planted a row of asparagus in each road, as indicated by the larger dots. There was also an asparagus seed-bed from which I planted another 3½ acres with asparagus this spring. No tobacco was placed on the seed-bed. The place where the seed-bed had been is now a part of the new asparagus plantation. Several hundred plants which were not needed were heeled in about 50 paces away from the former seed-bed; most of them were sold, but some, perhaps fifty, remained. The plants with which those former roads were planted were, of course, taken from the seed-bed, where no tobacco had been used. The only places attacked by beetles this summer are those four roads, the space where the seed-bed had been, and the plants heeled in. Had I used tobacco on the seed-bed I think my plantation would have been entirely free from the beetle.

I had used tobacco in former years against the cut-worms which ate off the young shoots of my grapevines, by surrounding each plant with stems, dug in, with entire success. * * * —[G. A. Schmitt, P. O. box 156, Wellesley, Mass., July 11, 1888.

Increased ravages of Icerya in California.

During the latter part of last week and the early part of the present one I have been out to Pasadena and down to Orange, helping two different parties to get their fumigators in operation. The party at Orange told me that if he could not make a success of the gas he would cut down his trees, and several other orange-growers have told me the same thing in regard to their own trees. You have doubtless seen in the Pacific Rural Press that Mr. A. S. Chapman has resigned his position on the State Board of Horticulture, giving as his reason for so doing that the ravages of the Icerya had forced him to abandon fruit-growing. He and his father own what was once one of the finest orange and lemon groves in southern California, but is now almost worthless, owing to the ravages of the scale insects. A few weeks ago his father, Mr. A. B. Chapman, told me that he took what money his oranges and lemons brought him and spent it in spraying his trees with one of the best caustic washes in use, and as a result his trees were injured to such an extent that they will bear no fruit the present year, while the scale insects are about as numerous as before the spraying had been done.

Several other growers in the San Gabriel Valley told me that they were seriously thinking of abandoning their orange and lemon groves on account of the scale insects. It is getting to be a very serious question in this part of the State.—[D. W. Coquillett, Los Angeles, Cal., September 1, 1888.

The Green-Striped Maple Worm.

* * * For four years now our soft maples (*Acer rubrum*) have been defoliated by a disgusting worm, twice in a season ; and the vitality of the trees has been a good deal weakened. A more systematic warfare has been waged against them this spring than ever before, however, and the indications are that their numbers will be considerably reduced. I inclose a local item of mine in relation to them, and also some eggs.—[H. W. Young, publisher *Star and Kansan*, Independence, Kans., May 31, 1887.

REPLY. * * * The eggs which you send are those of the moth of the Green-striped Maple-worm (*Anisota rubicunda*). This insect is not treated in the pamphlet which I send you but was figured and described in Professor Riley's Fifth Annual Report on the Insects of Missouri. The newspaper clipping which you inclose as clipped from the *Star and Kansan* of May 27 is very sensible, and the remedy which is proposed is as good as anything which can be suggested. This hand-picking of the eggs is tedious but satisfactory when done thoroughly, and a spraying with London purple is also good where the apparatus is easily obtained. In the Missouri report just mentioned Dr. Riley recommends that a trench should be dug either around an individual tree or around the grove or belt. The trench should be at least a foot deep, with the outer wall slanting. Great numbers of the worms when about to leave the tree to transform will collect in this trench or bury themselves in the bottom, and may there be easily killed. The trouble with this remedy is that it destroys the worms after the damage has been done, but it will at the same time reduce the numbers of the next generation.—[June 9, 1887.]

Wheat Saw-Flies.

The accompanying bottle, contains a grub—found on my wheat. Last year, just before harvest, I found nearly one-half the stalks of wheat had lost their head, which I found lying on the ground just beneath the stalk, uneaten, and I could not imagine what had done the mischief. This year I watched more closely ; I discovered this fellow at work. Can you tell what he (or she) is?—[John S. Gittings, Baltimore, Md., June 6, 1887.

REPLY.— * * * The worm which is damaging your wheat is the larva of a Saw-fly, which has become quite abundant in the last two years in Ohio, Indiana, Pennsylvania, New Jersey, Delaware, and Maryland, confining its attacks to wheat and timothy grass. Up to two years ago none of these Saw-flies were known to possess this habit in this country, but this species now bids fair to become quite a pest. The life-history has not been fully made out as yet, and it will be very difficult to suggest a remedy at this time. An agent of the division stationed in Indiana is devoting his time to the study of insects affecting wheat and other grains, and he has been instructed to pay special attention to this insect. You will probably not be further bothered with them this season, as the majority of them will go in the ground to pupate within a few days. A topical remedy, applied to the worms in the field, is out of the question on a large scale, and we can only hope to bring about a destruction of the pupa or the adult insect. * * *—[June 7, 1887.]

* * * I have this morning, as per request, placed in a tin box a few worms, with food ; hope they will be received in better order. The fly to which you refer I noticed in large numbers on the wheat some two weeks since. They were larger than the common house-fly, and I think a bluish appearance. I inclose in the box some heads of wheat as I find them on the ground. They are working vigorously now. They do not maliciously cut off the head ; it is for the purpose of the better opportunity to sap the stem or eat the stem. They are vigorous feeders, and if their numbers were great would destroy the entire crop ; they are evidently increasing ; more numerous than last year. They can cut a head of wheat off in twenty minutes. They then feed upon the stem for a long time. My impression is each worm destroys at least two heads

each day, morning and evening. I do not agree with you as to the time of disappearance. They will feed upon the wheat for several days yet. Last year they destroyed wheat until the grain of wheat was well formed, say the middle of June. Hot suns, warm, dry weather is not favorable to them. I sincerely hope we may be relieved from so dangerous a pest, as this portion of Delaware is devoted largely to the growing of wheat, myself and the two adjoining farms here growing 350 acres of wheat.—[H. A. Newland, Middletown, Del., June 3, 1887.

REPLY.— * * * The fresh larvæ indicate that the species is identical with one which we received last year from Indiana. We have an agent in the field at Lafayette, in that State, who is devoting his entire attention to the subject of grain insects, and you can rest assured that this species will not be neglected. It promises, as you say, to become a serious pest.—[June 4, 1887.]

Was it an Accident, or a Wily Milkman?

In the bottle that you will get with this you will find something that we got in the milk this morning; the family were made sick lately, as we suppose, from drinking milk, and I send you this in the interest of science in case it is something new to you, as it is to me, and I would be obliged if you would drop me a line stating what it is.—[W. W. Ryan, 715 Eleventh street, northwest, Washington, D. C., June 30, 1885.

REPLY.— * * * Your note of the 20th instant and the bottle of milk duly received. An examination of the object in the milk showed it to be the pupa of a small beetle surrounded by a little mass of apparently flour and curds. The species proved to be *Trogosita mauritanica* which is found in flour and grain, and the inference is pretty plain that your milkman diluted his milk with some farinaceous material. * * *—[July 1, 1885.]

Cranberry Gall-mites.

I send you by mail this day a package containing a lot of diseased cranberry vines The disease seems to be a fungus growth, and seems likely to destroy the vines. Will you be kind enough to have it examined and also inform me what it is, and any remedy that may occur to you?—[John H. Brakeley, Bordentown, N. J., July 12, 1887.

REPLY.— * * * The small pinkish excrescences are the galls of a gall-mite of the genus *Phytoptus.* These insects will be difficult to destroy as they can not be reached at this season of the year by any application, as they are inclosed within the galls. Do they appear to be wide-spread, or is the damage confined to a comparatively few vines? If it can be determined when the mites first appear in the spring they can then be destroyed by the use of a little sulphur, but we shall be unable to indicate the proper time until the history of this particular species has been studied. So far as we can find out at present it is something new.—[July 15, 1887.]

SECOND LETTER.— * * * As yet I have heard of these diseased vines appearing on only one bog. The disease has spread considerably there. I have advised the proprietor to keep a look-out for a very small fly, which may betray itself by its numbers.

REPLY.— * * * "It will be a waste of time for the proprietor of the cranberry bog which you mention to 'keep on the lookout for a very small fly which may betray itself by its numbers,' as the producer of the gall sent by you, with your previous communication, is not a small fly, but a true Mite. If the disease of the leaves has appeared only upon one bog, of course a very satisfactory way of getting rid of the pest, for some time to come, will consist in picking the leaves from the entire bog and destroying them by fire. Your association and the proprietor of the bog can best determine upon the desirability of going to this expense, but it seems to me it will pay you to assist him in this matter. It is possible also that by carefully watching the leaves and ascertaining when the galls begin to crack and the adult insects to issue, a long flooding of the bog will result in the destruction of a great number of the Mites."—[July 19, 1887.]

Notes on the Chinch Bug in Minnesota.

I have just returned from a rather extensive trip through our southern counties, chiefly to study the Chinch Bugs. There will be but little trouble in 1889, as a very large percentage of these insects has been killed by a fungus (*Entomophthora*). The same disease appeared early in August upon our experimental plots. It started from some holes dug along a low board fence made for the purpose of collecting and killing the bugs; thence it spread to fields with oats and wheat. These fields had a very dense growth of young red clover growing upon them as well, which shaded the ground thoroughly and kept it moist. In a week the disease had spread over the whole farm, and would have killed all the Chinch Bugs if the prevailing moist conditions had continued for some time. But it became very hot and dry, and in the course of a few days the disease came to a sudden halt, excepting in very low or well-shaded fields. As soon as the disease appeared I collected large numbers of the diseased insects, and mailed them to various parts of the State infested by Chinch Bugs. My last trip was made to investigate the effects of this experiment. I found the Chinch Bugs nearly exterminated wherever the disease has artificially been introduced. But the disease has also been at work quite a distance from these centers of introduction, and consequently I am in doubt whether I re-introduced the disease or not. This "but" is quite a bore, and it is now impossible to fathom the truth. If possible I shall keep on experimenting with the various fungi destroying insects, and think of starting, next year, a "cholera farm" in this locality, providing the health commissioners allow it.—[Otto Lugger, University of Minnesota, September 10, 1888.

Epidemic diseases of the Chinch Bug in Illinois.

We are in the thick of work—botanical, entomological, and experimental—on the two chinch-bug diseases which I reported in 1882, both of which are now wide-spread and destructive in southern Illinois. The Entomophthora (12th report, page 53) sprinkles the ground so thickly in some fields with the dead bugs that it makes one think of a flurry of snow; and the bacterial affection seems to be even more destructive, although less conspicuously so. If it comes in the way of any of your people to send me some living bugs from a region where their numbers are not evidently diminishing, I would be glad to have them for experimental use.—[S. A. Forbes, Champaign, Ills.

STEPS TOWARDS A REVISION OF CHAMBERS'S INDEX, WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord Walsingham.

[Continued from page 84.]

BUTALIS.

By the addition of the four new species now described, the representatives of this genus known in the United States and Canada are raised to the number 13: these include the unicolorous, mottled, and streaked forms known in Europe, but at present no species allied to the spotted *B. flabella* Led. has been met with. The only two American species with which I am personally unacquainted are the pale "white" or "whitish" *B. planipennella* Chamb. and *B. albipennella* Chamb.

Butalis impositella Z.

=*Gelechia monstratella* Wlk.
=*Butalis matutella* Clem.

This synonymy is verified by reference to Zeller's type, Walker's type, and Clemens' type.

Chambers writes (Bull. U. S. G. G. Surv., IV, 93) that, having bred a large series of *matutella* Clem., he finds its range of variation includes the forms described by himself as *dorsipallidella*, *brevistriga*, and *immaculatella*.

We shall therefore be probably safe in considering these names as synonyms for one species of which *matutella* Clem. is the type, but this yields priority to *impositella* Z. I am unable to accept Chambers' further suggestion that *trivinctella* Z. should be also included here. The only two specimens I have of this species show a strongly marked difference in the direction, although not in color, of the markings and appear to represent a distinct type, but it should be easy to arrive at a correct conclusion by repeating Chambers's experiments and breeding from the larvæ which feed in a web on the under side of the leaves of various species of *Aster*.

Butalis basilaris Z.

= *flavifrontella* Clem.

This synonymy, suggested by Stainton (Tin. N. Am., 40), is verified by comparison of a true specimen of *flavifrontella* Clem. with Zeller's type of *basilaris*.

Butalis suffusa sp. n.

Antennæ, mouse-gray.

Palpi, mouse-gray, dusted with whitish.

Tongue, clothed at the base with whitish scales.

Head, mouse-gray, streaked with whitish scales on the face and at the sides.

Thorax, mouse-gray, sprinkled with whitish scales.

Fore-wings, mouse-gray, sprinkled and suffused with whitish (in some cases overspreading nearly the whole wing-surface), the scales are narrow and elongate, recalling to mind those of *Butalis pilosella* Z., cilia mouse-gray, with a faint brownish tinge.

Hind-wings and cilia, brownish gray.

Abdomen, mouse-gray, specked with whitish; lateral claspers with a broad, rounded, central projecting end; a rounded, shorter excrescence on the upper side; and a somewhat acute pointed process beneath, which leaves the main stem considerably before its hinder margin; in this respect differing from *Butalis ochristriata*.

Exp. al., 10–12^{mm}.

Habitat, Mount Shasta, Siskiyou County, Cal.

Type, ♂, *Mus. Wlsm.*

I took 6 males in August, 1871.

Butalis perspicillella sp. n.

Palpi, white at the base and all along their upper side; the end of the second joint and the whole of the third joint smeared with brownish fuscous below.

Head, brownish-fuscous in front, margined above and at the sides with white, which extends around the eyes and on the outer side of the basal joint of the antennæ.

Thorax, whitish-ocherous, tinged and smeared with brownish-fuscous, the center above having a purplish iridescent tinge.

Fore-wings, whitish-ocherous, tinged and smeared with brownish-fuscous; having two short brownish, fuscous streaks, the first adjacent to, but below, the fold on the basal third of the wing; the second on the fold scarcely beyond the middle of the wing; above the fold is another short streak, lying nearer to the first than to the second of these already mentioned; towards the apex is a slight fuscous shade preceded by a small spot of the same color; cilia brownish-fuscous.

Hind-wings, iridescent purplish-fuscous, coarsely scaled; cilia brownish-fuscous.

Abdomen, iridescent purplish-fuscous above; the lateral appendages on the ultimate segment whitish ocherous.

Exp. al., 10^{mm}.

Habitat, California.

Type, *Riley Coll.* [U. S. N. M.], No. 166, labeled "Folsom 15, 4, 85, California."

Butalis aterrimella Wlk.

Gelechia aterrimella Wlk.

The following is a description taken from fresh specimens, undoubtedly identical with this species:

Antennæ, simple brownish-black.

Palpi, brownish-black.

Tongue, clothed at the base with brownish-fuscous scales.

Head, face, and thorax, brownish-black.

Fore-wings, brownish-black, with a patch of scattered white scales on the middle of the fold, and a few whitish scales beyond them, sparsely scattered towards the apical portion of the wing; these white scales appear to be very fugitive, and in a worn specimen are almost entirely removed; cilia, grayish-fuscous.

Hind wings, brownish-fuscous.

Underside of fore and hind wings, brownish-fuscous.

Abdomen, brownish-fuscous, with a few ocherous scales about the ultimate segment in the male.

Legs, brown-black.

Exp. al., ♂ 14^{mm}, ♀ 13^{mm}

Habitat, St. Martin's Falls, Albany River, Hudson Bay; Orono, Me.; Mount Shasta, Siskiyou County, Cal.

Type, ♂, *B. M.*

Both sexes received from Professor Fernald, taken at Orono; I have also a single, male, which I took on Mount Shasta in August, 1871.

Butalis ochristriata sp. n.

Antennæ, brownish-gray.

Palpi, whitish, widely barred across the outside of the second joint, at its upper end, with brown-gray, and sprinkled with the same color along the under side of the apical joint.

Tongue, clothed with whitish scales at the base.

Head, mouse-gray, fading to whitish laterally around the eyes.

Thorax, mouse-gray, paler at the sides and on the patagia.

Fore-wings, mouse-gray, sprinkled with long whitish scales on the outer half of the extreme margin, and all over the apical portion of the wing to the base of the dorsal cilia; a broad whitish-ocherous streak starts from the middle of the base and follows the line of the fold, to beyond the commencement of the dorsal cilia, fading into the ground-color on the middle of the wing above them; cilia brownish-gray.

Hind-wings, brownish; cilia brownish-gray.

Abdomen, mouse-gray; ♂ with the lateral claspers bulged above at their outer extremities, and prolonged at their lower angle into slender points, tending obliquely downwards, and about equal in length to the posterior margin of the claspers themselves; in this respect as in its coloring this species differs from its numerous allies.

Legs, whitish-gray.

Exp. al., 11^{mm}.

Habitat, Sheep Rock, Siskiyou County, Cal.

Type ♂, *Mus. Wlsm.*

Described from two males taken in August, 1871.

Var. A.—In some specimens the mouse-gray ground color of the fore-wing is replaced by brownish-fuscous or purplish-fuscous; the light scaling on the costa and apical portion of the wing being obsolete, and the hind-wings assume an almost purplish tinge.

Habitat, Mendocino County, Cal. A single female taken on May 24, 1871; Siskiyou County, Cal., seven males, August, 1871.

Types, ♂ ♀, *Mus. Wlsm.*

Var. B.—Another variety has brownish-gray fore-wings, the whitish-ocherous stripe being entirely, or almost entirely, obliterated, a number of scattered dull whitish-ocherous scales giving a mottled appearance to the almost unicolorous fore-wings. Some specimens of this variety are very small, their expanse reaching only 9^{mm}.

Habitat, Shasta County and Siskiyou County, Cal.

Types, ♂ ♀, *Mus. Wlsm.*

Described from nine males and five females taken in July and August, 1871.

I should certainly have regarded these three forms as specifically distinct had it not been for a careful examination of the genital appendages, which appear to be precisely similar. Moreover, my specimens of all the forms were taken at approximately the same time and place.

Butalis albilineata sp. n.

Antennæ, brownish-fuscous.

Palpi, white, dusted with brownish-fuscous, especially on the outer side.

Head, brownish-fuscous, with some whitish scales on the face and about the eyes.

Thorax, brownish-fuscous, touched with white on the patagia.

Fore-wings, brownish-fuscous, with a strong white line of even width running from the middle of the base to the apical margin below the apex; the extreme costa very narrowly whitish beyond the middle; cilia brownish-fuscous with a few white scales along the costa and beneath the apex.

Hind-wings and cilia, ♂ dark purplish-fuscous; ♀ brownish-fuscous.

Abdomen, brownish-fuscous above, white beneath.

Legs, brownish-fuscous, with a good deal of white about the tarsi and on the underside.

Exp. al., 10^{mm}.

Habitat, Arizona.

Types, ♂ ♀, *Mus. Wlsm.*

One male and two females received from the late H. K. Morrison.

This species approaches very closely the European *B. schleichiella Z.*

Arotrura, gen. n.

["αροτρον = plow, οὐρα' = tail.]

Type *Arotrura eburnea* Wlsm. ♂ ♀.

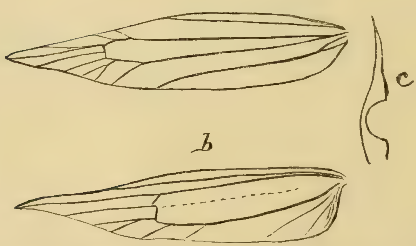

FIG. 22.—AROTRURA EBURNEA Wlsm. Neuration and uncus. *a*, Anterior wing; *b*, posterior wing—enlarged (original).

Antennæ, simple throughout; basal joint flattened, elongate.

Labial palpi, porrect, slightly recurved; basal joint clothed with closely appressed. scales; apical joint two-thirds as long as the second, tapering, but somewhat stout.

Maxillary palpi, very short and inconspicuous.

Tongue, very long, clothed with scales only at the extreme base.

Ocelli, absent.

Head, smooth.

Fore-wings, elongate, sharply lanceolate, the costa slightly bulged before the middle; 11 veins; 3 and 4 from a common stem; 7 and 8 from a common stem, the lower branch running to the apex, the upper to the costa.

Hind-wings, elongate-lanceolate, sharply pointed, the costa arched before the middle, the abdominal margin somewhat widened and depressed.

Abdomen, genital segments of ♂ largely developed; the uncus and lateral claspers tapering posteriorly; the points, slightly upturned, extending three-sevenths of the whole length of the abdomen; the ovipositor of the ♀ extruded.

Arotrura eburnea, sp. n.

Antennæ, ivory-white; basal joint elongate, flattened at the base, and slightly arched.

Palpi, ivory-white; clothed with appressed scales, which are somewhat dilated downwards on the basal joint only; apical joint about two-thirds the length of the second, somewhat less stout, but by no means slender.

Tongue, very long, clothed at the base with ivory-white scales; beyond, naked, light yellowish-brown.

Head, face, and thorax, smooth ivory-white.

Fore-wings, elongate, sharply lanceolate, ivory-white; cilia, ivory-white.

Hind-wings, pale grayish-fawn; cilia pale fawn at their base, fading outwardly into fawn-white.

Under side of fore and hind wings, tinged with grayish-fuscous in the ♂, tending to pale fawn color in the ♀.

Abdomen, ivory-white; somewhat ochreous beneath; ♂, uncus single, very long wide at the base, but somewhat laterally compressed above, having a narrow stalk immediately beyond the base, whence it is laterally compressed, downwardly dilated, and tapering posteriorly to a narrow and slightly upturned gouge-shaped point; lateral claspers rounded externally, with an angulated projection at about the middle of the upper edge, whence they taper posteriorly to a narrow, slightly upturned obtuse point, reaching as far as the end of the uncus; within these claspers, and projecting slightly beyond the angle at the middle of the upper edge, are two spatulate appendages, or supplementary claspers, fringed, with hairs along their edges and about their surface. ♀ with the ovipositor strongly exserted, flattened at the base, and fringed at the extremity with similar hairs to those found on the supplementary claspers of the male.

Exp. al., 20^{mm}.

Habitat, Arizona.

Types, ♂ ♀, *Mus. Wlsm.*

Two males and one female received from the late H. K. Morrison.

Without a careful examination of the neuration and genital segments this species would undoubtedly have been regarded as a *Butalis*, for although somewhat larger than the ordinary forms of this genus; it has almost exactly the shape of wings and general appearance which distinguish it. The fore and hind wings are, however, somewhat narrower towards the apex.

(*To be continued.*)

GENERAL NOTES.

SYNONYMY OF THE MEALY BUG OF THE ORANGE.

In 1880 Prof. J. H. Comstock described the common Mealy Bug found on Orange trees in Florida as *Dactylopius destructor*,* and by this name it has since been generally known in this country. The same species is stated by Professor Comstock to be common in northern greenhouses upon a variety of plants.

In the Florida Dispatch for June 25, 1888, Mr. W. H. Ashmead announces that *D. destructor* Comstock is synonymous with *Lecanium phyllococcus*, described by him in the *Canadian Entomologist* for August 1879 (Vol. XI, No. 8, p. 160), and that the species should therefore be known as *Dactylopius phyllococcus* (Ashm.).

There is little doubt, however, that this species is identical with the *Coccus citri* of Boisduval (see Boisduval, Entomologie Horticole, 1867, p. 348, fig. 48), as described at length by Signoret in the Ann. Soc. Ent. France, 1875, page 312, and as figured upon Plate XIV, figures 2, 2^a, and 2^b of the same volume, under the name *Dactylopius citri* (Boisd.). This conclusion is arrived at by Penzig in his Studi Botanici sulle Agrumi e sulle Piante affini, Rome, 1887, p. 530, after a careful comparison of Comstock's descriptions and figures with the European insect; and there is at present no reason why this conclusion should not be adopted in this country.

D. citri is said by Penzig to be one of the worst of the Orange enemies in Italy, both from the damage caused by its punctures and from the abundance of the smut fungi—*Meliola* and *Cladosporium*—by which its attacks are followed.

ENTOMOLOGY IN CHILI.

Prof. Frederico Philippi lately favored us with copy of his "Catalogo de los Coleopteros de Chile" (reprinted from the Anales de la Universidad de Chile, Vol. LXXI, 1887). Since the publication of Vols. IV and V (1849–'51) of the "Historia fisica i politica de Chile" by Claudio Gay, this is the first attempt at collating the Coleopterous fauna of that country. In Gay's "Historia" the Coleoptera known from Chili amounted to 345 genera with 891 species, whereas Prof. Philippi is now able to enumerate 686 genera with 2,247 species. This is undoubtedly a large increase, but the whole number evidently represents only the smaller portion of the Coleoptera actually occurring in Chili, which is so diversified in regard to climatic and geological conditions. From the nature of the conditions it is apparent that the Chilian fauna admits of but little opportunity for comparison with the fauna of North America. Still, in perusing Philippi's catalogue we find that it contains 30 species

* Rept. Ent., Ann. Rept. Dept. Agr., 1880, p. 342.

which occur also in North America. By far the greater portion of these are, however, species of general distribution occurring in almost every part of the globe. Eliminating these, the following true American species are common to the faunas of the United States and Chili: *Tetracha carolina*, *Bidessus affinis*, *Laccophilus americanus*, *L. proximus*, *Gyrinus parcus*, *Tropisternus glaber*, *T. lateralis*, *Lathrobium dimidiatum*, *Atænius gracilis*, *Bruchus scutellaris*, *Megilla maculata*, *Eriopis connexa*.

Besides this work on Coleoptera, we have a Catalogue of the Chilian Lepidoptera, by Mr. William Bartlett Calvert, published at Santiago de Chile in 1886, and which enumerates 89 species of Diurnals and 366 of Heterocera; and a list of the Chilian Diptera by Dr. R. A. Philippi in the Verh. K. K. Zool. Bot. Ges. in Wien, 1865, which of course is now somewhat antiquated.

THE LARVA OF THE CLOVER STEM BORER, *Languria Mozardi* Latr., AS A GALL MAKER.

On September 5, 1888, while searching for galls on Solidago, which grows abundantly on the bluffs in the vicinity of La Fayette, Ind., we found a well-developed gall on a stock of wild lettuce (*Lactuca canadensis*, L.). This gall was opened carefully, and found to contain a pupa, plainly Coleopterous, of a yellowish color, much enlarged anteriorly but more slender posteriorly. The gall was at once bound up, the pupa having been replaced in its cavity exactly as found, and the whole placed in a glass jar. On September 21, sixteen days after, an adult of *L. mozardi* made its appearance in the jar, and an examination of the gall revealed the cavity empty, and the avenue therefrom through which the beetle had made its escape.

Prof. J. H. Comstock states in the report of the Commissioner of Agriculture for the year 1879, p. 199, that the insect, as a clover pest, pupates in the lower part of the stem in which the larva originated. We have ourself found larvæ not distinguishable from those of this species burrowing in the stems of timothy, where they pass the winter in the larval stage (see Report Commissioner of Agriculture, 1886, p. 574). The question involved seems to be, is the species evolving to or from a gall maker?—[F. M. Webster.

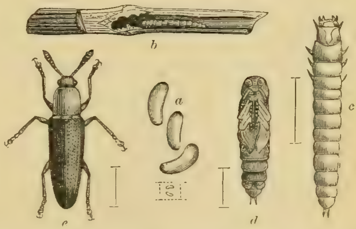

FIG. 23.—LANGURIA MOZARDI. *a*, egg; *b*, larva in clover stem; *c*, larva; *d*, pupa· *e*, adult (after Comstock).

THE USE OF OSAGE-ORANGE AS A FOOD FOR SILK-WORMS.

Some three years ago the chamber of commerce of Lyons, France, established a silk laboratory, under the direction of Monsieur J. Dusu-

zeau. Among the many objects of this work was that of collecting specimens of the cocoons of wild silk worms from all portions of the world, with a view to determining whether their silk might not be used commercially to a greater extent. It was also desired to find some wild species which might be successfully crossed with the *Bombyx mori* and lend new vigor to a species which has been weakened by centuries of domestication.

At the same time some interest has been excited by the success attained in this country through the use of osage-orange (*Maclura aurantiaca*) in feeding silk-worms, and at the request of M. Dusuzeau, the Division has furnished him with specimens of osage-raised cocoons. Of them he writes:

These three varieties of cocoons are very regular, firm, and fine. I have recently reeled 100 grams of each, and I will send you, a little later, complete reports of the three trials. I must say to you that the variety fed upon mulberry reeled excellently, without the threads breaking; those of the two varieties fed on maclura were a little less satisfactory, breaking several times. But it will not be possible to draw an exact conclusion from this trial, because the first lot is of unknown origin and can not be compared with the second and third lots, themselves raised from eggs furnished by different houses.

The request for the samples mentioned came too late for me to make a selection proper for such an experiment. This year a better selection will be made and it is hoped that results of more value may be obtained.

In this connection M. Natalis Rondot, the celebrated French statistician, writes:

I am anxious to settle this question of the raising of worms on the leaves of the osage orange, as I am now doing in China, with the leaves of the *Cudrania triloba*.*

Before determining what advantage the silk raiser would derive in using the leaf of the maclura, it will be necessary to know what is the quality of the silk drawn from the cocoons of the worms nourished with this leaf. It will be necessary to examine the filament of these cocoons.

In this work the Division will give the French scientists all the assistance in its power, and it may be that we shall be able to record important results at a later date.—[Philip Walker.

THE PEAR DIPLOSIS IN ENGLAND.

In our Annual Report for the year 1885 we gave a full account of this insect, and from the mode of its occurrence we had good reason to believe that it was an importation from Europe and probably identical with the *Cecidomyia nigra* (Meigen) of Schmidberger and *C. pyricola* of Nördlinger. At that time no European specimens of the imago existed in any collection, so that a direct comparison of the European and American species was out of the question. In 1885 Miss E. A. Ormerod (report of observations of injurious insects for 1884) first called attention to the existence of the Pear Midge in England, the pest being espe-

* The *Cudrania triloba* is a bush of the Nettle family (Order *Urticaceæ*). It is not found in the United States.

cially bad in Marie Louise pears. However, no imagos were obtained until, in 1887 and 1888, Messrs. R. H. Meade and Peter Inchbald succeeded in breeding the imagos. Mr. Meade carefully compared them with our description, and finds the English insect absolutely identical with the American form. He has recently published a very careful and independent description of the imago, giving at the same time a full account of the life-history of the insect as hitherto observed in England.* In view of the uncertainty regarding the names given to the insect by the older authors, viz: *Cecidomyia nigra* of Meigen and Schmidberger, and *C. pyricola* of Nördlinger, Mr. Meade proposes to drop these names and to accept *Diplosis pyrivora* Riley, which we had provisionally given and by which it can be identified with certainty.

THE ORCHID ISOSOMA AND A REMEDY FOR ITS INJURY.

Some years ago Professor Westwood described a phytophagous species of the Chalcid genus Isosoma (*I. orchidearum*) which is injurious to Orchid plants belonging to the genus *Catleya*. These are ornamental and highly-prized plants, the pride of owners of greenhouses, and the injury by the Isosoma larvæ infesting the stems and the leaves is very annoying. M. Künckel d'Herculais announces (Ann. Soc. Ent. de France, 1888, Bull., p. 23) that he, in connection with M. Gazagnaire, is studying this Isosoma which has appeared in some greenhouses in Paris, and that he is preparing a paper on the subject. M. Gazagnaire proposes to kill the Isosoma larvæ in their burrows by means of a triangular dissecting pin. The larvæ do not need to be extracted, and the wound inflicted on the plants by this botanico-surgical operation is insignificant.

The insect has been quite common in some of the Paris conservatories lately, and in view of the skepticism which yet prevails among some of the English entomologists as to its phytophagic nature, we may add that from specimens submitted to us by Dr. L. Felix Henneguy while we were in Paris last October, we had an excellent opportunity of rearing both sexes and of watching the larvæ in all stages. We repeatedly saw the larva feeding on the orchid substance, and the cavity made is at first only just large enough to contain it and its vegetal frass.—C. V. R.

FALSE REPORT OF PHYLLOXERA IN AUSTRALIA.

Australia has just recovered from a Phylloxera scare. The *Adelaide Garden and Field* for July, 1888, states that rumors had been current for a few days that the phylloxera had been discovered at a Mr. Hardy's vineyard at McLaren Vale. The report arose from the fact that some vine cuttings recently planted showed a peculiar enlargement of some

* Diplosis pyrivora Riley, the Pear-gnat, by R. H. Meade. The Entomologist, Vol. XXI, No. 300, May, 1888, pp. 123–131.

of the rootlets. This proved on investigation to be a fungus disease of the vine.

APROPOS TO HOT WATER AS AN INSECTICIDE.

Our esteemed New Zealand correspondent, Mr. R. Allan Wight, writing as to the use of hot water as an insecticide, tells a rather remarkable story as follows:

An old lady of his acquaintance had a fine old grape-vine in her garden which went over the wall and bore fruit in her neighbor's yard, and she was spiteful enough to take the kettle off the fire and pour the entire contents on the vine (she dared not cut it down, for both houses were rented from the same landlord). She failed of her purpose, for the vine was not injured in the least.

VALUE OF DEAD LOCUSTS AS MANURE.

In a letter to us some time ago Mr. J. Birkbeck Nevins, of Liverpool, gave an analysis of dried locusts from observations made by Edward Davis, F. C. S., President Liverpool Literary and Philosophical Society, as follows:

	Without wings.	Wings developed.
	Per cent.	*Per cent.*
Phosphoric acid (P_2O_5)	1.92	1.89
Tribasic phosphate of lime	4.21	4.13
Nitrogen	10.14	10.64
Ammonia	12.31	12.92

This shows that these dried locusts are as rich in nitrogen as meat, guano, or dry blood, and contain enough phosphoric acid to greatly increase its value as a manure, which English authorities estimate at about $25 per ton.

THE INSIDIOUS FLOWER-BUG.

According to *Garden and Forest* for August 22, *Triphleps insidiosus* has been doing considerable injury among some of the Chrysanthemum collections near Boston this summer by piercing the ends of the shoots, causing them to "go blind" and the leaves to curl up and wither. The statement is made that pieces of cloth kept saturated with kerosene oil bound around the ends of slender sticks and stuck in the ground among the plants so that the saturated cloth is about on a level with the ends of the shoots, seems to have the effect of driving away the insects.

○

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Office Staff: L. O. Howard, First Assistant; E. A. Schwarz, Th. Pergande, Tyler Townsend, W. B. Alwood, Assistants; Philip Walker, Assistant in silk-culture and in charge of reeling experiments.

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Honorary Curator: C. V. Riley.

Assistant Curator: John B. Smith.

☞ For bibliographical purposes it may be necessary to state that, where expedient, the names or initials of members of the force will be attached to their communications. Where initials alone are appended, the full name can be ascertained by referring to the list above given.

Editorial or unsigned articles or notes should be accredited to "Insect Life," or, where it is desired to give personal credit, to "Riley and Howard." While most of the correspondence of the Division is carried on by myself, yet much of it is also attended to by my first assistant, Mr. Howard, who acts as Entomologist in charge during my absence, and otherwise so materially assists in editorial and office work that only those articles signed by either should be considered individual.—C. V. R.

U. S. DEPARTMENT OF AGRICULTURE.

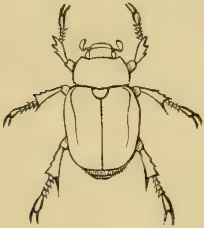
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. NOVEMBER, 1888.

Vol. I. No. 5.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS, WITH THE SANCTION OF THE COMMISSIONER OF AGRICULTURE.



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1888.

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SPECIAL NOTES.

Prof. A. J. Cook's latest bulletin * is devoted to a consideration of experiments with insecticides and implements for their application. The larger portion of the bulletin refers to the treatment of apple trees for Codling Moth and plum and cherry trees for Plum Curculio. Professor Cook designed to show the relative effect on foliage from repeated sprayings with London purple and also the comparative immunity from injury of trees so treated. The data on which he constructs his table are so indistinct that it is difficult to form conclusions concerning them. We gather, however, that where trees were treated once the foliage was uninjured and few apples were perfected or ripened; where treated twice, foliage slightly injured and "much fruit" perfected; where treated three times, foliage more injured (sometimes seriously) and "much fruit" perfected. The applications were made on the 6th, 12th, and 20th of June. The preparation used was 1 pound London purple to 100 gallons of water. The check trees were crab-apples, one of which bore few apples and the other bore heavily. He concluded that "it is more and more patent that it pays remarkably well to spray our apple trees."

In view of the extensive practical experience of orchardists for many years now with the arsenites as a protection from the Apple-worm, additional experimentation is hardly necessary on this point, as the value of this preventive method has become fully established, the only question to be advantageously discussed in connection therewith being the risk of poisoning, which, as experience and Professor Cook's experiments in the past have shown, is reduced to a minimum, or may be left out of account altogether where proper precautions are taken. It is otherwise with these arsenites as a preventive for Curculio attack. We have long felt that they might be used with benefit for this purpose, and have recommended their trial, but from the nature of the case we have anticipated less good than in the case of the Apple-worm, and Professor Forbes' experiments and some unpublished experiments which we have had made by Mr. Alwood confirm this view. Several plum and

* Agricultural College of Michigan, Department of Zoology and Entomology. Bulletin 39. September, 1888.

cherry trees were treated by Professor Cook with London purple on the same dates, with the result that good crops of perfect fruit were gathered, "while cherry and apple trees near by suffered seriously." Professor Cook concludes that with plums, cherries, and apples, two or three applications for the Curculio are of advantage.

He also discusses methods of applying liquids, mentioning favorably the geared Victor Field force-pump, the Perfection hand-pump, Gould's double-acting barrel-pump, the Whitman pump, and the Lewis pumps. Some of these we could not indorse so favorably for such work, but will withhold any remarks we might make for a forthcoming bulletin on this subject. The subject of nozzles is mentioned, and in six words he disposes of the Riley or Cyclone nozzle as a comparative failure, an experience which neither accords with our own nor with that of many other horticulturists and entomologists both at home and abroad, and makes one question whether Professor Cook uses it properly or in improved forms. The Nixon nozzle and the Lowell graduating nozzle are commended. All the illustrations are from trade circulars.

A number of remedies, aside from arsenical sprays, are noticed. Among these, carbolized lime and plaster for Curculio, applied dry, are said to have been successful. Bisulphide of carbon was used very successfully to destroy ants by making an opening down into the colony, pouring in about half a gill of the liquid, and stopping up the opening by packing in clay. We have had best success with it by igniting it after covering the ground for about ten minutes with a damp blanket.

Mr. C. P. Gillette, the entomologist of the Iowa station, has two articles in Bulletin No. 2 of the station,* received October 8, the one entitled "A few important Chinch Bug remedies," and the other "Arsenic experiments."

Under his first head, Mr. Gillette considers plowing, burning, shading the ground, and neat farming. Mr. Gillette has made some experiments in plowing, and finds that when the bugs are buried to a depth of 7 inches they never come to the surface again. At 5 inches nearly all are permanently interred, while at 3 inches they all emerge within twenty-four hours. He advises, therefore, that the furrow should be turned at least 6 inches deep, and that a jointer should be used on the plow.

The subject of using soluble arsenic as an insecticide has again been brought to public attention by several writers, and this probably suggested Mr. Gillette's experiments. But we believe that its use does not rest on a clear conception of what constitutes a practical insecticide. The end sought in the use of arsenic is to destroy the insect with a minimum amount used in the safest possible manner to plant and ani-

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* Iowa Agricultural College, Experiment Station. Bulletin 2, August, 1888.

mal life. So far as plant life is concerned, it is much preferable to use it in insoluble form, and used in this form we can not see that it is any more apt to cause injury to stock.

A series of experiments directed towards the preparation of an arsenite of less specific gravity than Paris green, and not more insoluble than London purple, would in our estimation yield good results. Soluble arsenic, because of its rapid absorption by the leaves of plants and consequent caustic effects, is useful only in comparison with other preparations.

Mr. Gillette's conclusions from his experiments with arsenic are practically those reached by us as long ago as 1879, and as formulated in Bulletin 3 of the Entomological Commission. He finds by experiment that arsenic in the proportion of 1 pound to 400 gallons of water scorches the tips and edges of the leaves of Apple. One pound to 800 gallons damaged the leaves of Plum too badly to allow this strength to be recommended. One pound to 250 gallons scorched the leaves of Grape badly. One pound to 400 burnt the leaves of Box Elder badly. One pound to 500 burnt the leaves of Honey Locust badly. One pound to 800 scorched the leaves of Poplar badly. One pound to 500 destroyed one-half of the surface of the leaves of Raspberry, etc. American Elms resisted the best of any plant experimented upon, while Plum was most susceptible. With the latter tree he found that in the proportion of 1 pound to 1,200 gallons of water about half of the leaves were taken off and the remainder were left looking sickly and somewhat burnt. He concludes that arsenic can not be used in solution stronger than 1 pound to 1,200 gallons of water, and experiments show that apple leaves sprayed with this solution could be fed to the larvæ of *Datana ministra* without apparently affecting them. Tests made by the chemist of the station, Prof. G. E. Patrick, show that the leaves unquestionably absorb a certain proportion of the arsenic. Mr. Gillette expresses himself more strongly against the use of this poison than any one who has yet written about it. He says, "It would be unwise in the extreme to recommend the latter (arsenic), especially if it be in solution, for insecticidal purposes."

Both the articles are timely, and we look forward with interest to the results of Mr. Gillette's work. Both, however, are marred by very abundant orthographical errors, probably the result of hasty proof-reading.

Washington and other eastern cities have been exceptionally free from the attacks of shade-tree pests the past summer, particularly from the defoliators, such as the Elm Leaf-beetle and the Fall Web-worm. The Web-worm has been exceptionally scarce in Washington, and only late in September were a few webs of the second generation observed. The Elm Leaf beetle, while rather more abundant, has been much less so than

usual, and this reminds us of an occurrence which shows how careful one must be in drawing conclusions from experiments to destroy insects. Counting upon the ordinary appearance of the Elm Leaf-beetle, we sprayed the trees in our garden with London purple early in the summer, and as no damage was done, we were quite of the opinion that the spraying had been a success until, later, we noticed that unsprayed trees were quite free also. In the same way a gentleman came to us toward the end of the season and informed us that he had completely protected his trees, by spraying the grass under them with Paris green, his trees for the first time in several years having retained the verdure of their foliage.

SOME RECENT ENTOMOLOGICAL MATTERS OF INTERNATIONAL CONCERN.*

Entomology is one of the most fascinating branches of natural history, but its devotees find such a vast number of species to deal with (very many yet unstudied) that their work is for the most part somewhat exclusive and interests few but the specialist. In truth, though so important in the economy of nature and in their relations to man, insects are yet too often looked upon as rather unworthy his serious thought.

Nevertheless there are many insects which possess general interest by virtue of the manner in which they affect man directly or indirectly. Among such may be mentioned species which prevail in several different parts of the world, and the interest is enhanced if they affect man's comfort and convenience, or are injurious to agriculture or horticulture. It is my intention this evening to refer to three of the latter class, which have lately become rather notorious.

In doing so I omit extended consideration of the methods that recent investigation have shown to be most efficient in enabling the cultivator to contend with and control these enemies to agriculture; for, though this practical bearing of the subject is of immense importance to the people concerned, I take it that none of those in my hearing are practically interested.

THE ICERYA OR FLUTED SCALE.

The first is what I call the Icerya or Fluted Scale (*Icerya purchasi* Maskell). It is one of our largest scale-insects (family *Coccidæ*), and has of late years done immense injury to the orange groves and to many other trees and shrubs of southern California. The history of the species is interesting, and points to Australia as its original home and to its introduction from Australia to New Zealand, Cape Town, South Africa, and California. Nothing was known or published upon

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*Read by C. V. Riley before the Philosophical Society of Washington, D. C., March 31, 1888, and illustrated by diagrams.

the species prior to the seventh decade of this century, and it seems to have first attracted attention almost simultaneously in Australia, Africa, and America, all the evidence pointing to its introduction into California by the late George Gordon, of Menlo Park, about the year 1868, and probably from Australia on *Acacia latifolia.*

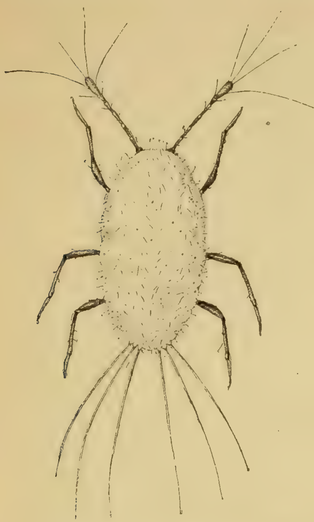

Fig. 24. *Icerya purchasi*, newly hatched female larva—greatly enlarged (after Riley).

The genus *Icerya* was founded by Signoret, a French entomologist, in 1875, being based upon the single species *I. sacchari* (Guérin). This species and the one that we are now dealing with are the only two species of the genus.

In my Annual Report as United States Entomologist for 1886 I have given a very full characterization of the species in all its stages, but the only facts that I need draw attention to on this occasion are, first, "That the female undergoes three molts and the male two; *i. e.*, each has one more stage than had previously been recognized by entomologists and observers; secondly, that it differs from all other members of its family (*Coccidæ*) in its extended powers of locomotion in most of its stages; in its extreme hardiness or power of surviving for a given period without food, and in its

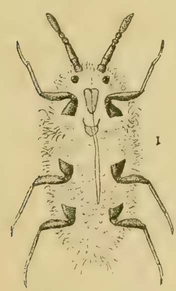

Fig. 25. *Icerya purchasi*, male larva, second stage—greatly enlarged (after Riley).

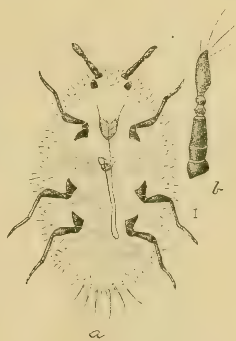

Fig. 26. *Icerya purchasi*, *a*, female larva, second stage—enlarged; *b*, antenna—still more enlarged (after Riley).

polyphagous habit, or the ease with which it accommodates itself to so great a variety of plants. These are the three characteristics which most concern the practical man and which make it one of the most difficult species to contend with.

FIG. 27. *Icerya purchasi*, female larva, third stage—enlarged (after Riley).

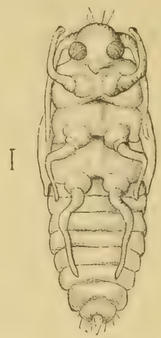

FIG. 28. *Icerya purchasi*, male pupa, ventral view—enlarged (after Riley).

"A very long list of plants might be enumerated upon which this insect is either found accidentally or upon which it can live more or less successfully. But the list of plants, especially of trees, important to us for their products, which are seriously affected by it is compara-

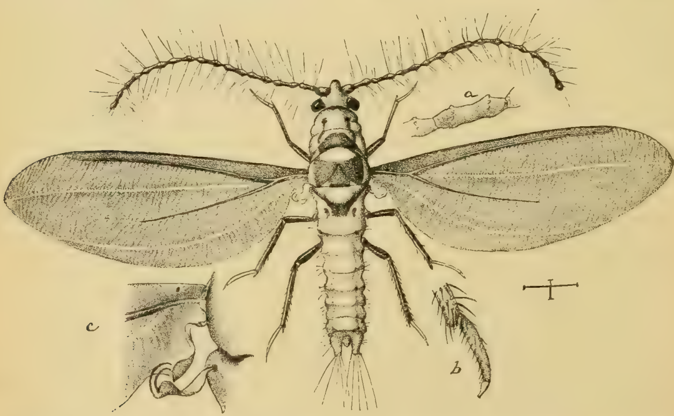

FIG. 29. *Icerya purchasi*, adult male, enlarged; *a*, joint of antenna; *b*, tip of tarsus; *c*, wing pocket and hooks, still more enlarged (after Riley).

tively limited, and will include the Acacia, Lime, Lemon, Orange, Quince, Pomegranate, and Walnut. Some few other trees might be added, and it is particularly partial to the Rose and the Nettle; but it is doubtful whether the species could permanently thrive and multiply to an injurious extent on many other trees than those mentioned.

"All young scale insects are quite active when they first hatch, and most of them at this time are extremely small, and when very thick upon a tree, instinctively, or at least very easily, drop from the terminal twigs and branches. Their specific gravity at this time is so slight that they are easily wafted with the wind in their descent. This general truth applies with equal force to the Icerya, which is readily carried from tree to tree and from orchard to orchard by the agency of wind, by running water, or by birds or other insects. Another local means of transport not to be ignored is upon the clothing of persons engaged in cultivating, upon packages, and upon all implements used, whether in cultivating or harvesting the crop. This particular species also has quite a habit of crawling over the ground, and its local spread is very materially enhanced thereby.

"It is carried long distances, however, chiefly by high winds, birds, and commerce, and its introduction from one continent to another has undoubtedly been effected by the latter method upon young trees or cuttings."*

More light, however, is yet needed upon the question of the original habitat of the species, and as the settlement of the question is important in many respects I have during the past year been endeavoring to get definite information upon the subject. Without going into technical details, which would not interest you, I may briefly state that the question arose in my mind a year ago as to the probable identity of *Icerya purchasi* and *I. sacchari*, which last came from the islands of Mauritius and Bourbon, and which is injurious to Sugar-cane there. On the supposition that the two described forms were specifically identical, light is at once thrown upon its wide distribution. It occurred to me that an insect which affected the sugar-cane could be easily transported from the sugar-producing islands in the Indian Ocean to Australia, South Africa, and California, either consecutively one from the other, or to either or all directly, through the sugar trade, especially when it is known that in many cases in packing the coarser sugars it is the custom to put pieces of cane in the packages to facilitate drainage. I took some pains, therefore, to first decide by an examination of specimens whether *purchasi* was really distinct from *sacchari* or not, and this could only be done conclusively by examination of the types. My old friend, Dr. Signoret, who is the leading French authority on the Coccidæ, was unfortunately very ill at his country home when I was in Paris, last October, but he kindly sent his keys and permitted me to examine his collection

* From an address by the writer before the State Board of Horticulture at Riverside, Cal., April 7, 1887.

and to satisfy myself that *sacchari* was really distinct from *purchasi*. This fact, while not absolutely opposed to the idea of the origin of the Fluted Scale from the islands of Bourbon and Mauritius, because both species may occur there, tends, nevertheless, to confirm the prevailing opinion, and that which I originally held, viz, that the native home of the species is in Australia.

A limited number of natural enemies and parasites have already been discovered upon it in California. They are as follows:

Among predaceous insects:
- *Chrysopa* sp.
- *Hippodamia ambigua* Lec.
- *Blastobasis iceryæella* Riley
- *Blapstinus brevicollis* Lec.
- ? *Perimegatoma cylindricum* Kirby, var. *angulare*.
- *Largus succinctus*.
- *Piesma cinerea* Say.
- *Corizus hyalinus* Fabr.
- *Peritrechus luniger* Say.
- *Beosus* sp. (probably new).
- *Lyctocoris* sp. (probably new).
- *Piezostethus* sp. (probably new).

Among true parasites:
- *Isodromus iceryæ* Howard.
- *Coccophagus* n. sp.
- *Entedon* n. sp.
- *Alaptus iceryæ* n. sp.
- *Thoron* n. sp.
- ? *Goniozus* n. sp.

In Mexico:
- *Phora* sp.
- *Scymnus amabilis* Lec.

In South Africa:
- *Rodolia iceryæ* Baly.

Now, as the number of these enemies (and particularly of the parasites) increases, the fruit-growers of California will get more and more relief from the ravages of the Icerya; but it is an interesting fact that in Australia, which, as we have seen, is in all probability its native country, the species is not so injurious as it is with us, the reason being, doubtless, that it has natural enemies there which serve to keep it in check, and which have not been transported with it to the countries of its introduction. Here we have a case where it would be eminently fit to have these enemies in Australia especially studied and to attempt to introduce them to California; for the successful accomplishment of this would, without doubt, result in immense benefit to the people of that State. With most of the parasites this would be an easy matter from the very manner in which they are known to affect the Icerya. In fact, since I delivered an address upon this subject, last spring, at Riverside, Cal., the people of that State have been alive to the importance of the subject, and have in county and State conventions appealed by resolution to Congress to authorize the sending of a commission to Australia for this purpose.

This is nature's method of checking the evil, and one which it were wise for man to adopt. At the present time it is possible for the fruit-growers of California to protect their fruit trees by vigilant means and rather large expenditure of time and money, and where these are not employed ruin stares the orange-grower in the face. The introduction of the natural enemies which keep the species in check in its native country would soon bring about a change in this country, and its intro-

duction would relieve the orange-grower of the necessity of so much expenditure to bring about the same result. Just as we employ cats to kill off mice and ferrets to kill rats, so in economic entomology it behooves us to encourage the entomological enemies of our insect foes, especially in cases like the present, where there is a feasible method promising good results in the introduction.

THE HESSIAN FLY.

(*Cecidomyia destructor* Say.)

This is a fragile midge belonging to the Diptera and to the family Cecidomyidæ, and you will get a very fair idea of its general color and appearance by recalling the common mosquito. It is one of the insects most destructive to Wheat, Rye, and Barley. At the present season it is found in what is known as the flax-seed or puparium state. This is the hardened larval skin inclosing the quiescent larva and ultimately the pupa. These puparia are more or less hidden in the base of young wheat plants and the perfect flies issue as soon as we get settled spring weather, and in fact are issuing in southern latitudes at the present time. The sexes are easily distinguished by the simpler antennæ of the female as compared with those of the male, by the more robust abdomen and extensile ovipositor. She deposits her eggs between the ribs of the blades generally near the base; the young larvæ hatching therefrom suck the substance of the stalk and imbed themselves more or less fully within it. There are two broods annually, and in southern latitudes a tendency to a third one. Few insects have more often been treated of or more fully written about than this, and an added interest has lately been given to it because of its recent introduction into England. The species has long been known to occur upon the continent of Europe and the prevailing belief has been that it was introduced therefrom into the United States during the Revolutionary war by Hessian troops. It was first announced in England some two years ago by Miss. E. A. Ormerod, consulting entomologist of the Royal Agricultural Society, and it has proved more or less injurious and rapidly extended during the past two years, so that at the present time it is found on most portions of the eastern coast extending up into Scotland.

In North America the species has constantly, since the first announcement of its appearance on Long Island, spread farther and farther west with the westward movement of the center of wheat culture, so that at the present time it may be said to extend over nearly the whole wheat area of the United States, except perhaps the extreme northwestern and the southwestern limits, where the excessive dryness of the atmosphere, in the one case, and the excessive heat of summer, in the other, have proved, so far, obstacles to its successful multiplication. For a long time it was unknown on the Pacific coast, but during the past three years it has been quite injurious in parts of California.

Now its advent in England, a century after it was brought to this country, has caused a good deal of discussion, and while I was over there last autumn I found that not only British agriculturists, but the British public generally were intensely interested in the subject and quite agitated as to the prospects in the future.

Three points particularly interest the grain grower as well as scientific men, viz, the date when the insect was actually imported into England, the country it was introduced from, and the prospects from its work in the future.

I had occasion to consider all of these points at some length in the *London Times* for October 17 last, but in this connection have time only to say that as to the first point there is likely to be the same controversy as there has been in reference to the periods of its importation into America, and just as all the facts point to the latter event about the time of the Revolutionary war, so the evidence points conclusively to its very recent advent into England. One of the strongest opponents of the view that the species was imported into this country by Hessians has been Dr. H. A. Hagen, of Cambridge, and though his arguments have some weight from the historic side they are weak from the biologic side, as they do not take into account the exceptional tendency to belated or retarded development which the species exhibits in the puparium state.

There was no way of definitely ascertaining from what country the insect was really introduced into England, but by a study of the parasites which had so far been detected in England. Hence I was urged while there last year to examine such parasites as had been reared there.

This material was submitted by Miss Ormerod, Professor Fream, Lord Walsingham, Mr. O. E. Janson, Mr. Fred. Enock, Mr. F. M. Campbell, and others who interested themselves in the subject and were anxious for determinations.

A study of these parasites enabled me to identify them as *Platygaster minutus* Lind., *Semiotellus nigripes* Lind., *Eupelmus karschii* Lind., *Merisus intermedius* Lind., *Tetrastichus Rileyi* Lind., *Euryscapus saltator* Lind., *Dacnusa senilis* Hal.; and while the material that was placed in my hands will require some little revision of a paper which I have already published on the parasites of the species in America, yet they are all essentially European and point unmistakably to the importation to England from the continent of Europe. The negative evidence, so far as it goes, confirms this, because statistics show that from 2 to 3 per cent. of the straw imported into England comes from America, and the importation has not been made through the chief ports of entry of American vessels, such as Liverpool. In fact the species has not yet been found in Ireland or on the western coast of England, being confined, as already remarked, to the east coast.

In reference to the third point, viz, the future injury that is likely to

be done in England, I may briefly state that on account of the cooler summers and milder winters and the lateness at which wheat is sown in England there is very little danger, in my judgment, of any such injury as we suffer from here, or as the insect causes in portions of continental Europe. In fact it is very injurious only under conditions where two annual generations are pretty uniformly produced, and I am satisfied that in England, as a rule, only one generation will be produced.

THE HOP PLANT-LOUSE.

The next insect which I will say a few words about is the Hop Plant-louse (*Phorodon humuli*), of which we have been able to say for the first time the past year that we now know positively its full life history. I have for some years desired to settle a question that has been mooted among entomologists, as also among hop-growers, viz, the mode of hibernation of the species; for while some of the earliest writers upon aphidology have believed, and even stated, that there was a form of this insect that occurred in autumn on the Damson in Europe, the statement has been as confidently controverted and the fact denied by some of the highest authorities in the family. Hop-growers as a class have generally pooh-poohed the idea. Yet, from my own experience with other species of the family and with their singular life history and migrations from one plant to another, I had for some time felt convinced that *Phorodon humuli* also must have some other winter resting place than the hop vine,

FIG. 30. *Phorodon humuli*. stem-mother, enlarged, head and antenna still more enlarged (original).

FIG. 31. *Phorodon humuli*, first migrant from plum, third generation, enlarged; head at side still more enlarged (original).

and after very careful and persistent investigation, in which I have had the co-operation of several of my assistants, the question has been fully and thoroughly settled.

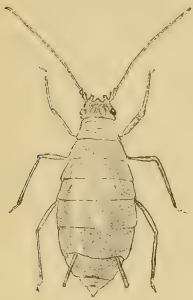

FIG. 32. *Phorodon humuli*, true sexual female, enlarged (original).

The facts in the life history of this insect, therefore, may be summed up as follows: Hibernating at the present season of the year, the little glossy, black, ovoid eggs of the species are found attached to the terminal twigs, and especially in the more or less protected crevices around the buds, of different varieties and species of Prunus, both wild and cultivated. From this winter-egg there hatches a stem-mother (Fig. 30), which is characterized by being somewhat stouter, with shorter legs and honey tubes than in the individuals of any other generation.

Three parthenogenetic generations are produced upon Prunus, the third becoming winged (Fig. 31). This last is what my late friend Lichtenstein called the *pseudogyna* or migrant, and it instinctively flies to the hop-plant, which is entirely free from attack during the development of the three generations upon Plum. A number of parthenogenetic generations are

FIG. 33. *Phorodon humuli*, male, enlarged (original).

produced upon the Hop until in autumn, and particularly during the month of September winged females are again produced. This is the *pupifera* of Lichtenstein or return migrant, and she instinctively returns to the Plum. Here she at once settles and in the course of a few days, according as the weather permits, produces some three or more young. These are destined never to become winged and are true

sexual females (Fig. 32). Somewhat later, on the Hop, the true winged male (Fig. 33), and the only male of the whole series, is developed, and these males also congregate upon the Plum, on the leaves of which toward the end of the season they may be found pairing with the wingless females, which stock the twigs with the winter eggs (Fig. 34). Such, briefly, is the life history. Twelve generations may be produced during the year, but there is great irregularity in the development of these generations and the return migrant from the Hop is produced at the the end of the season whether from individuals of the fourth or fifth generation, or of the twelfth. As I have remarked elsewhere* "each parthenogenetic female is capable of producing on an average one hundred young (the stem-mother probably being more prolific), at the rate of one to six, or an average of three per day, under favorable conditions. Each generation begins to breed about the eighth day after birth, so that the issue from a single individual easily runs up, in the course of the summer, to trillions. The number of leaves (seven hundred hills, each with two poles and two vines) to an acre of hops, as grown in the United States, will not, on the average, much exceed a million before the period of blooming or burning; so that the issue from a single stem-mother may, under favoring circumstances, blight hundreds of acres in the course of two or three months.

FIG. 34. *Phorodon humuli*, eggs and shriveled skin of female which laid them—enlarged (original).

" While meteorological conditions may materially affect the increase and power for injury of the species, these are far more truly predetermined and influenced by its natural enemies, many of which have been studied and will be described.

" The slight colorational differences, as also the structural differences, including the variation in the tubercles or cornicles on head and basal joints of antennæ, whether upon Plum or Hop, are peculiarities of brood and have no specific importance whatever.

" The exact knowledge thus gained simplifies the protection of the hop plant from Phorodon attack. Preventive measures should consist in destroying the insect on Plum in early spring where the cultivation of this fruit is desired, and the extermination of the wild trees in the woods wherever the hop interest is paramount; also in avoiding the introduction of the pest into new hop countries in the egg state upon plum cuttings or scions. Direct treatment is simplified by the fact that the careful grower is independent of slovenly neighbors, infection from one hop yard to another not taking place."

The bearing of these facts will probably best be brought home to

*Paper read before the British Association, Manchester, September 2, 1887.

you by the statement that hitherto hop-growers have been groping in the dark and working to prevent injuries by applications to the soil. In fact, the English hop growers have been led by their very best authorities to waste their energies in this direction. The importance of the matter will appear when I state that the hop crop, which is quite an important one in some parts of this country, and especially important in some parts of Europe, annually suffers from the ravages of this its worst insect enemy, and some years is rendered a total failure by it. Further, that some parts of this country, as the Pacific coast, are yet free from it and that hop-growers thereby being forewarned may prevent its introduction from the East or from Europe, as there is very little doubt in my mind but that the insect has been introduced from one country to another in the egg state upon plum scions, as it may easily be transported from place to place in this manner. I had the pleasure during September and the early part of last October to finish up the investigation and follow out the closing scenes in the life history of this species in the county of Kent, England, while some of my assistants were doing the same thing in Herkimer County, New York, and the facts independently obtained correspond in a remarkable manner, thus confirming and strengthening the conclusion which I have indicated to you.

SUMMARY.

All three of the species which I have brought to your notice have been imported to this country from other countries, and this is the case with the vast majority of the worst weeds and insects of American agriculture. I should naturally be led, in closing, to some considerations growing out of this interesting fact; for it is noteworthy that such introduced species often, and indeed as a rule, outstrip the native species in the struggle for existence, and become abnormally destructive to cultivated crops. In America and the other newer, but, geologically speaking, older, parts of the world, as Australia, one reason for this state of things is patent, viz, the fact that the natural enemies of the species are, as a rule, not brought with it, so that it has much freer play in its reproductive powers than it has in its native country where such natural checks occur. But there are other just as potent facts which tend to bring about the greater destructiveness of introduced species in the countries mentioned, and one that has not been fully realized has always struck me with much force. It is this, that most of such species are introduced from Europe or the older civilizations where, on evolutional grounds, it is natural to suppose that they are the very species which have become accustomed to the civilized conditions induced during so many centuries. In other words, the species which most abound and have most successfully accommodated themselves to such artificial conditions, have, in the geologically brief period of man's pre-eminence, acquired advantages over species which have

not been submitted to such environment. The former, when brought into competition with the latter, under such conditions, rapidly outnumber them and get the upperhand.

THE FOOD HABITS OF THE THRIPIDÆ.

By Herbert Osborn, Ames, Iowa.

In general the food habits of all the species in any circumscribed group of animals will be found to agree quite closely, and any departure from such unity of habit will furnish interesting, often important, subjects of study.

In the *Thripidæ* we have a small group of insects remarkably well defined and agreeing so closely in structural characters that we would expect in them very close uniformity in food habits. Nevertheless, there has been wide difference of opinion upon this point, some believing them to be essentially herbivorous, while others have held for all, or some, of the species a carnivorous diet.

In the *Canadian Entomologist* for 1883 (Vol. XV, p. 151), I have presented a brief résumé of the American species, with some notes regarding food habits. Since then I have made such observations as possible and have also collected testimony from various sources, so that it seems to me possible to present sufficient evidence to warrant a conclusion approximating the truth.

Without repeating the substance of my paper in the Canadian Entomologist, I may state in brief the most important sources of evidence there referred to.

Mr. Haliday, whose monograph of the European species has been the foundation for all subsequent work, treats them as herbivorous, as does also Westwood in the "Classification."

In this country Dr. Fitch, Dr. Packard, and Professor Comstock have described species as injurious to plants.

Mr. Walsh held strongly to the belief that they were carnivorous, and I will here state his arguments in full. In the proceedings of the Entomological Society of Philadelphia he says:

> On June 8 I noticed a few imagos of a large Thrip in some galls of *P. caryæfoliæ* which were at that time full of their normal tenants; on June 22 I noticed in galls of the same insect on the same trees many red pupæ, apparently of the same Thrips, which seems to have supplanted or exterminated the *Phylloxeræ*, for almost every gall contained six or seven Thripid pupæ and but very few *Phylloxeræ*.

In the Proceedings of the Entomological Society of Philadelphia (Vol. III, pp. 611–12), he says:

> What is the cause of this phenomenon (the absence of larvæ in Cecidomyian galls) I can not say with certainty, but I suspect that the egg or the very young larvæ of the "gall-gnat" is to a great extent destroyed within the gall by being punctured and sucked by some insect foe; and that that foe probably belongs to Thripidæ.

Authors have hitherto always considered this remarkable family as vegetable-feeding, but from many facts which I have observed, one of which I have recorded (Proc. Ent. Soc. Phila., I, p. 310), I believe that they are generally, if not universally, insectivorous, and that those that occur on the ears of wheat, both in the United States and in Europe, are preying there upon the eggs or the larvæ of the Wheat Midge (*Cec. tritici*), and are consequently not the foes, as has been generally imagined, but the friends of the farmer. In confirmation of these views, it may be remarked that the very same species (*Thrips cerealium*), which has been stated by all European authors to attack the ears of the wheat, was found by Vasali Eandi in Italy "to gnaw the stems of the wheat above the knots and cause the abortion of the ear." (See Westw., Intr., II, p. 4.) Is it probable that the same species should attack the same plant in two such very different parts? I believe that the Italian Thrips were attacking Hessian Flies (*Cec. destructor*) or some such wheat-destroying insects that inhabit "the stem above the knots," and that it was these last and not the Thrips that caused the "abortion of the ear." The Thrips that were supposed to do so much damage in Wisconsin, as related by Dr. Fitch (N. Y. Rep., I, p. 304), were said to attack both the blossoms of the wheat and the blossoms of the clover. But it is not the genera- habit of insects to prey at the same time upon two plants which are so widely dis. tinct as wheat and clover—the one Monocotyledonous, the other Dicotyledonousl Even the Polyphagous army-worm refuses to eat clover.

Now, as already stated, I have myself noticed several Thrips in June both in the larva and imago state on the Cecidomyidous gall *S. ænigma*, and have raised the larva to maturity in a breeding-jar in which there was nothing but that gall. Moreover, Dr. Fitch found his *Phlœothrips caryæ* in hickory galls, which are manifestly either closely allied to or identical with the Cecidomyidous hickory gall *Tubicola* O. S., though he doubts whether these galls were produced by the Thrips or by some other insect (N. Y. Rep. II, p. 127), and Osten Sacken observes of the galls of the Cecidomyidous *Lasioptera vitis* O. S. that some of the galls' hollows are often abandoned by their inmates and invaded by numerous Thrips. (Dipt. N. A., p. 201.)

In Practical Entomologist, Vol. I, p. 21, he says:

I do not believe that the Thrips of entomologists are, as has hitherto been universally believed, vegetable feeders; but that, on the contrary, they are cannibal insects, preying upon injurious larvæ, and therefore the friends and not the foes of the agriculturist.

Still further in the Practical Entomologist, Vol. II, p. 50:

Naturalists hitherto had always supposed that these Thrips were vegetable feeders and injurious to plants. In the Proceedings (Entom. Soc. Phil., III, pp. 611, 612) I suggested "that they are generally, if not universally, insectivorous, and that those that occur on the ears of the wheat, both in the United States and in Europe, are preying there upon the eggs or larvæ of the Wheat Midge (*Diplosis tritici*), and are consequently not the foes, as has been generally imagined, but the friends of the farmer." At the conclusion of this passage I gave several reasons for my belief, and I have since found Thrips preying upon the gall-making larvæ of more than twenty different galls, growing on different trees and other plants, so that there is now no manner of doubt in my mind that Thrips is a true cannibal insect. The importance of this discovery may be seen at once. The larvæ of a minute Flea-beetle (*Haltica*) often grieviously infests clover blossoms, feeding upon and destroying a large portion of the seed. A Thrips occurs also sometimes in large numbers on these blossoms.

Hitherto farmers, when they detected Thrips on their clover, had supposed that a new enemy was invading it. Now, when they see the Thrips there, they may go to bed and sleep comfortably, satisfied that the depredations of the real enemy are about to be checked; and in the same way, whenever in wheat fields infested by the larvæ of the Wheat Midge (popularly known in the East as the "Milk Weevil" and in the West as the "Red Weevil") Thrips are discovered in the ears of the infested grain,

the farmer may know that a friend has come to his rescue, and that the Great Author of Nature is saying to the little pest, through the mouth of the minute and almost microscopic insect which He has appointed to do His work, "Thus far shalt thou go, but no farther, and here shall this grievous plague of flies be stayed."

I may remark here that I have found a few Thrips haunting the leaf galls, which have so abounded everywhere, in 1866, on the Clinton grape-vine, and which have been named *vitifoliæ* by Dr. Fitch. There can be but little doubt that they were preying here upon the minute bark-louse, which produces this leaf-gall. I have also noticed them to be very abundant in the flowers of the Bracted Bind-weed (*Calystegia sepium*). As a small plant-feeding beetle (the *Conotelus obscurus* of Erichson) also occurs in great numbers in the same flowers, it is not improbable that the Thrips may feed upon its larvæ.

In speaking of the natural enemies of the Phylloxera, Dr. Riley says (Mo. Rept., VI, pp. 50, 51):

The most efficient is a black species of Fringe-wing or Thrips, with white wings—*Thrips phylloxeræ* of my MS. The egg, which is thrice as large as that of the louse, ellipsoidal, and with a facetted surface, is deposited within the gall among its legitimate inhabitants, and the young Thrips, which differ from their parents not only in lacking wings, but in being of a blood-red color, with only the extremities and the members black, play havoc with the lice. They are active, supple creatures, and turn up menacingly the posterior part of the body when disturbed. They are found in several different kinds of Phylloxera galls, and do more than any other species to keep the leaf-inhabiting grape Phylloxera within bounds.

Mr. Pergande, whose acquaintance with the Thripidæ is very extensive, writes in Psyche (III, p. 369):

That many species of the Thrips are vegetable feeders in some of their stages has long been well known, and I have seen numerous species on all kinds and all parts of plants, and some of these Thrips I have seen in the act of feeding, but I have also observed that not all species have entirely the same habit, and that some in one stage or another are carnivorous. Especially have I noted this to be the case with a species which is frequently found upon the leaves of *Platanus* and upon other plants which are badly infested with *Tetranychus telarius*, upon the adults and young, and probably also upon the eggs, of which these Thrips feed. It may also turn out that two or three species which swarm in great numbers in the blossoms of clover, which are usually full of the eggs and larvæ of *Cecidomyia leguminicola*, are particularly carnivorous, and further observations may prove that they mainly search and feed upon the *Cecidomyia*. I may also mention here that this year, as late as November 14, after several quite cold days, I found for the first time *Heliothrips hæmorrhoidalis* Bouché on apple leaves in the orchard of the United States Department of Agriculture, as lively and active as in hot-houses, where this species was only observed previously. I may also mention the presence of *Heliothrips dracænæ* Heg. in the conservatory of the Department of Agriculture, an insect which is reported as doing immense damage to *Dracænas* in hot-houses in different parts of Europe.

In 1886 Dr. Karl Lindeman published results of his studies on the Thrips in Russia, and treats of five species as infesting various plants.

Thrips secalina Lindeman, a new species infesting and subsisting upon grain and Timothy grass.

Phlœothrips frumentaria Bel., in ears of corn, the larvæ sucking its food from the plant.

Chirothrips antennata Osborn, a species that was first discovered by

the writer in heads of Timothy grass in Iowa, and next recorded by Lindeman as living on the same and other plants at Moscow.

Aptinothrips rufa Hal., he states to subsist upon grasses and compositæ.

Phlœothrips armata Lindeman, is a new species that he describes as affecting *Anthemis tinctoria*, *Chrysanthemum leucanthemum*, and other plants.

Professor Lintner included *Limothrips* (*Thrips*) *tritici* Fitch in his lists of clover insects (Report of New York Agricultural Society for 1881–'82, p. 192), and also mentions a "*Thrips* sp." in the same connection.

In Prof. W. J. Beal's Grasses of North America, Professor Cook, in chapter on insects, page 375, says of Thripidæ:

> The past season I have found three species, one black, one light yellow, and one bright red, all to be very abundant on the clover blossoms, yet I could not see that they were greatly injurious.

Further, page 401 of same work, in regard to grass withering in summer:

> This is more likely due to species of Thrips, three of which I have taken from the culms.

Professor Cook also informs me that Professor Fernald has described the attacks of one species on grass, but I have not the reference at hand; and also that he has dissected Thripidæ, and found their stomachs to contain grains of pollen.

The species referred to as attacking grass may very likely be the same as credited with destroying grass by Professor Comstock, and given the manuscript name of *Limothrips poaphagus.*

Since presenting the statements in my paper published in 1883 I have watched every season the work of the common species at Ames, and especially in clover heads have noted the operations of thousands of individuals. In all these observations I have not seen a single example of *Cecidomyia* larva or anything to indicate attack upon these or any other insects. On the contrary, as recorded in my report to Professor Riley for 1887 (Rep. Dep. Ag., 1887), I have seen the Thripidæ fall a prey to the Insidious Flower Bug (*Thriphleps insidiosus*). I feel pretty well convinced, therefore, that whatever they may do when *Cecidomyia* larvæ are present, they must be able to live without them, and it seems almost certain that they subsist upon the tissues of the clover itself, since they occur in all stages of development. I have also observed a species resembling *tritici* in Wild Morning-glory blossoms, Fitch's *Phlœothrips mali* on grape leaves, and what is presumably his *Coleothrips trifasciata* (though my specimens differ in certain characters given generic importance) on a common weed, and in none of these species have I seen evidence of feeding upon anything but the plant or its secretions. Last summer (1887) I collected an undescribed species from the leaves of hop in Wisconsin. Individuals of various sizes, mostly larvæ, being found more or less clustered together on the leaves, and there seemed to be

scarcely an opportunity to doubt that they were subsisting upon the plant. A species which agrees with *P. nigra* Osborn in every respect, so far as I can see, but in larval and pupal characters, occurs commonly on Mullein, and this species I have bred from egg to imago with no other food than that received from the mullein leaf, the injury to the leaf showing as yellow blotches, similar to those produced by *Tetranychus telarius.* I can therefore state positively that this species can mature upon purely vegetable diet. The leaves were kept in water in my office under constant observation, and the Thrips developed to maturity on the same leaves that the eggs were deposited upon by the adults.

The following summary of the species whose food habits have been noted will show the state of our knowledge so far as the different species are concerned and the records of which have come to my notice:

Phlœothrips mali Fitch, gouging into young apples (Fitch).
Phlœothrips caryæ Fitch, in hickory galls, food ? (Fitch).
Phlœothrips nigra Osborn, lives in clover heads.
Phlœothrips sp. near *nigra*, feeding on leaves and blossoms of Mullein.
Phlœothrips frumentaria Bel., larvæ suck grain in the ear (Lindeman).
Phlœothrips armata Lindeman, affecting Compositæ and Grasses (Lindeman).
Thrips tritici Fitch, injurious to wheat and clover (Fitch), attacking styles of apple blossoms (Osborn), injuring strawberry (various writers).
Thrips cerealium Hal., very destructive to wheat in Europe (Kirby, Curtis, *et al.*).
Thrips minutissimus L., infests potato (Curtis).
Thrips ochraceous, destructive to melons, etc. (Westwood, Curtis).
Thrips striatus Osborn, "destroys onion plants" (Packard).*
Thrips sp., very injurious to olive trees (Westwood).
Thrips sp., living on leaves of hop.
Limothrips poaphagus Comstock MS., affecting grass (Comstock *et al.*).
Limothrips graminea Pergande MS., affects corn, wheat, and grass (Pergande, Forbes *in lit.*).
Heliothrips hæmorrhoidalis Bouché, injurious in greenhouses and on apple.
Heliothrips dracænæ, Heg., reported very destructive in hot-houses (Pergande).
Heliothrips adonidum =*dracænæ* (?) infests greenhouse plants (Westwood).
Chirothrips antennata Osborn, in timothy heads (Osborn), timothy, wheat, and rye (Lindeman).
Aptinothrips rufa, subsisting upon Grass and Compositæ (Lindeman).
Coleothrips trifasciata Fitch, injurious to wheat (Fitch, Packard).

The conclusion to be drawn from the evidence at hand seems to me as follows :

That the Thripidæ as a group are normally herbivorous, and their presence on cultivated plants is a source of danger.

That they feed mainly on the exuded nectar or secretions of plants, when these are abundant, and on pollen, and at such times may do little or no damage.

That they will upon occasion attack the tissues of the leaves or the essential parts of the blossom and pierce them for their contents, and at such times may cause serious damage.

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* Packard also mentions this species (Entom. for Beginners, p. 197) as injurious to wheat, but I think it must be an error, and *Thrips tritici* intended instead.

That of the recorded species there are two at least which must be looked upon as carnivorous, in certain stages at least. The species here recorded by Mr. Walsh and Dr. Riley as infesting Phylloxera galls, and the one recorded by Mr. Pergande as destroying *Tetranychus*.

The attacks of Thrips upon *Phylloxeræ* seem explicable to me without supposing them, as Mr. Walsh did, essentially carnivorous. For, supposing that they first entered the gall to feed upon the exuded sap there, or the soft tissues so available for their use, it would not be a great change for them to feed upon the exudations from the lice, and later, if pressed for food, upon the lice themselves. This view may be erroneous, but it seems to me reasonable, though I have been unable to make observations to confirm it, because in all the galls of *Phylloxeræ* I have examined I have not as yet found Thrips present. It seems to me that we must consider the carnivorous diet, where present, as an acquired habit, or one but recently developed in the species, and that for all species upon which no positive observations have been made that the only safe ground to take is that they are a source of danger to cultivated plants; that is, to believe them injurious until they are proven beneficial.

The difficulty of making positive observations on the food habits of these minute creatures makes a general law regarding their habits very desirable, and I hope that evidence may accumulate which will enable us to determine still more certainly what is the actual relation which these insects bear to other organisms.

EXTRACTS FROM CORRESPONDENCE.

Danger to Human Beings from Use of Paris Green.

Thanks for Nos. 1 and 2 of "Insect Life." Your publications are great public educators and special aids to farmers. A more thorough knowledge of our friends and foes among insects and birds would increase our farm products. We hope you may find-out insecticides which are less dangerous to humanity than arsenic. Two cases of serious illness, but not fatal, have occurred in our neighborhood—one from eating strawberries planted alternately with potatoes which had been dusted with Paris green, and the other from eating raspberries adjoining the potato patch, from which the poison had blown. We hope that Congress will make all necessary appropriations for the carrying on of the good work.—[R. Bingham, Camden, N. J., September 22, 1888.

REPLY.—* * * I am glad to get the account of the two cases of poisoning from the treatment of potatoes by Paris green, and agree with you that a less dangerous remedy would be good. With proper care, however, there is very little danger, and in both the instances which you mention the application was evidently very carelessly made.—[September 25, 1888.]

The Clover Seed-midge in Ohio.

Will you please tell me the name of the "worms" that I send by the same mail with this letter? They were in the second crop of clover this season on my brother's farm. He would cut enough of the clover in the morning to feed twelve cows at

night, and let it lie in the wagon all day, and when he took it out at night the wagon box would be literally pink with them, they were so numerous. This was about the middle of August. I was away from home at the time, but he put some of them in a box to keep until I returned. I thought perhaps they were so well preserved you could identify them. * * * Last year we had the Chinch Bug, but I have only seen a very few of them this year.—[Miss E. J. Phillips, Chagrin Falls, Cuyahoga County, Ohio, September 21, 1888.

REPLY.—* * * The insect which you send this time is a common Clover Seed-Midge (*Cecidomyia leguminicola* Lintner). This insect was first discovered by Prof. J. A. Lintner in 1878 in New York State, but has since been found as far West as Wisconsin and north into Canada and south into Northern Virginia, so it is not at all strange that it should occur in your vicinity. It is particularly destructive to the clover-seed crop, but does not injure the quality of the hay. The insect was treated in the Annual Reports of this Department for 1878 and 1879 and also in Bulletin 12 of this Division. A very satisfactory remedy consists in cutting the first crop of clover from two to three weeks before the ordinary time, thus allowing that generation of the maggots no opportunity to mature.—[September 25, 1888.]

Formula for a Buffalo Gnat Application.

As I planted on the Mississippi River many years ago, I think my experience with Buffalo Gnats may be useful to others, as I never lost by them.

In the fall I always caught a quantity of fish with a seine, and got a quantity of oil from the offal. Early in the spring I put 5 pounds of roll sulphur in a large iron pot, and when melted poured in 2 gallons of pine-tar, stirring and taking the pot from the fire, and stirred in 5 gallons of fish oil until it was cool.

When the season came for gnats, each plowman was provided with a gourd containing a pint or two, which he hung up at the end of his row, and was instructed to examine the throat just behind the jaw, where they first attack. As soon as he observed any gnats, he passed the alarm along the line, and every plowman smeared the mixture over the nostrils, throat, and flanks of his animal. I protected my work-oxen the same way. The stock cattle were protected by smoke, or by lying on the sand-bars left by the river. I always had everything ready for the gnats, and as I protected my animals instantly I never had any animals injured by them.—[P. H. Skipwith, Oxford, Miss., August 30, 1887.

The Acid Secretion of Notodonta Concinna.

In rearing a brood of caterpillars, figured in Harris' work as "Red Hump" (*Notodonta concinna*), I discovered that they had the power to emit quite a quantity of strong hydrochloric acid, strong enough to be decidedly corrosive to the skin and easily perceptible in the atmosphere. This act was often performed when suddenly disturbed, and was noticed only in the older ones, though it might have been present when younger, but, if so, was unnoticed. As I find no mention of this power in any of the works at my disposal, I referred the matter to you, feeling, if not known before, you would be interested in it.—[Charles S. Denham, East Pepperell, Mass., August 22, 1887.

REPLY.—* * * So far as we can learn this acid secretion has not been noticed in print in reference to this particular species; but it is well known that many of the Philodontid larvæ allied to it have the power of ejecting from glands between the head and first segment such an acid liquid or vapor. A number of articles have appeared in the last two years in European entomological magazines in reference to this secretion, and we have noticed it in some four or five of our native species. * * *

Out-of-door Hibernation of Lecanium hemisphæricum in Pennsylvania.

About a year ago, I sent to the Department of Agriculture specimens of *Lecanium* which were pronounced *hemisphæricum*, which had infested an outdoor cucurbitous plant, from about the 1st of July until late in October, when the plant was removed (1886). After the plant (or plants) was removed I observed that about a dozen of the adult females had located on an upright support of the arbor, where they remained all winter. They were not examined until late in the following spring (1887), perhaps the 1st of May, and then I found them all vacated. The plants came up in great numbers in the spring, but my women folk considered them a nuisance and removed every one of them from the premises. On the spot formerly occupied by the vines my wife set some foreign ferns, where they remained until the advent of frost this fall, when I noticed that they were almost as badly infested as the *Echinocystis* was last season. I also found that a Japanese Quince (*Cydonia japonica*), over which these vines were permitted to run last year, were similarly infested. Now, I desire you to determine whether these are all the same species. Because, if they are, then *Lecanium hemisphæricum* is capable of an outdoor survival of the winter of South Pennsylvania, which may be a matter of some importance to know.

It may be pertinent to the subject to state that we have had these ferns in our possession for the past seven or eight years, keeping them in the house during winter, and setting them out during the summer, and I have never noticed a single specimen of *Lecanium*, or any other insect, on them until the present season, and I am confident that I would have noticed them sometime during the seven years had they been present. My observations last year demonstrated that this insect multiplies prodigiously on a curcubitaceous plant, and if it can endure the outdoor winter with impunity it may possess possibilities that can not be entirely ignored. * * * —[S. S. Rathvon, Lancaster, Pa., October 29, 1887.

REPLY.— * * * I recollect perfectly your correspondence of a year ago in reference to the *Lecanium hemisphæricum* and a note of the singular fact of its outdoor occurrence was made at the time for publication in an early bulletin. It has not, however, been published as yet, and your present observation will form an interesting postscript to it. An examination of the specimens sent this time upon the *fern* shows that they are *Lecanium hemisphæricum*, but those upon the twig of Japanese Quince belong to a different species—*Lecanium persicæ*. The latter species has long been known to infest peach and plum out of doors as far north as the latitude of New York City, but the wintering of *hemisphæricum* under the circumstances is of great interest. I have never seen this species even in the latitude of Washington upon anything but hot-house plants.—[November 2, 1887.]

The Introduction of Lestophonus iceryæ*.

* * * A Monophlœbus which was left in San Mateo on a Cherry Laurel badly infested, showed by a recent visit numerous holes, and judging from their condition two months previous when seen, at least 50 or 60 flies had hatched, all probably a month after being placed there. Of course it was too early to expect any of their progeny to appear, but if successful I shall look for them. * * *—[W. G. Klee, 220 Sutter Street, San Francisco, Cal., October 4, 1888.

A House infested with Psocidæ.

In March, 1886, a lady here bought a new mattress composed of hair and corn-husks. It was used daily until the following August, when the family left home for a six weeks' vacation. A day or two after the return in September, there were noticed on a pair of shoes, which had not been in recent use, several little colorless creatures resembling the common "book-lice" in appearance, some of which have been sent to you. Continuing the examination, what was her horror to find the under surface of

* See Insect Life, No. 1, p. 21.

the lower sheet and the upper surface of the mattress almost alive with the insects. To use her own language: "A pin-point could not have been put down without touching one or more of the bugs." Further search showed a very unpleasant state of affairs. The walls of the room were so covered with the insects that a sweep of the hand removed them by the thousand, and the other rooms in the house were almost as badly infested. The bureau drawers were swarming with them. They were behind the pictures and between the pictures and the glass in crawling cohorts. They were under everything and in everything. To say that the neat housekeeper was beside herself is putting it mildly indeed.

The mattress was removed and examined. Without exaggeration it contained millions. Then came the house-cleaning. The walls and floors were washed with solution of borax and corrosive sublimate. Pyrethrum powder was freely used. All the carpets were sent to the steam-cleaners. The furniture was beaten, cleaned, and varnished. The struggle was continued for a year with all the persistence of an extraordinarily neat housekeeper. The insects had the best of it, and held possession in diminished numbers. The family then removed to a hotel, while for days the closed house was fumigated by burning sulphur, and the scrubbing processes were afterwards repeated. The insects were again diminished, but the least relaxation in the struggle was soon followed by an increase of the enemy. Again the house was vacated, and the closed rooms were subjected to the vapor of benzine, basins and pans being filled and the fluid left to evaporate. The scrubbing processes were again repeated, and the lady began to hope that the benzine had been the concluding touch, although she continued to have the creatures on her mind and to watch for them. Her hopes were vain. The insects are still in the house, two years after the removal of the mattress, and in spite of all the harsh treatment they have received. These *Psocidæ* at least seem incapable of taking a hint. Their numbers are of course greatly reduced, but they still march over the walls and hide in dark places. If you can suggest a remedy that has not been tried, it will be accepted gratefully by that troubled lady, and faithfully employed.

As I close my letter it occurs to me that the house has been built less than three years, and that the present neat occupants are the only ones it has ever had; also that, in addition to the treatment detailed above, the house has been subjected to the fumes of burning charcoal.

If anything further is needed to show how tenacious of life these little creatures are, I may add that in order to mount them for microscopical examination they were immersed in liquefied crystals of carbolic acid, where they continued alive for several seconds.—[Alfred C. Stokes, Trenton, N. J., October 8, 1888.

NOTE.—The specimens received were all immature, so that it was impossible to determine the species. The insect belonged to the Psocidæ, but apparently not to the true genus *Psocus*.

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX, WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

BY LORD WALSINGHAM.

[*Continued from page* 117.]

INCURVARIA Haw.

Incurvaria punctiferella sp. n.

Antennæ, about half the length of the fore-wings: straw-colored at base, brownish beyond.

Palpi, very short, depressed; apical joint half the length of the second joint.

Head and thorax, straw-colored.

Fore-wings, pale, straw-yellow, with from 18 to 20 small chocolate-brown spots, somewhat varying in size, number, and distribution; not arranged in rows, except in so far as those on the outer half of the wing have a tendency to exhibit two oblique lines running parallel to the apical margin; the base of the costa tinged with chocolate-brown. Under side, brownish with pale cilia.

Head-wings and cilia, cinereous gray. Under side, pale grayish.

Abdomen, cinerous; uncus, short, obtuse, apex curved over in a semicircular form; lateral claspers, projecting nearly their whole length beyond the uncus, elongate, upturned, the upper angle of the posterior margin turned inwards, the margin itself rather oblique, with a sharp, short, projecting point at its lower angle; towards the base, the whole lower edge of the claspers is turned under and inwards almost at right angles with its outer surface, which itself appears to be of about equal width throughout.

Exp. al., 15^{mm}.

Habitat, Rouge River, southern Oregon, May 7, 1872; Mendocino County, Cal., May, 1871.

Types, ♂ ♀, *Mus. Wlsm.*

Incurvaria solenobiella Wlsm.

Abdomen, uncus short and obtuse; lateral claspers bulged on their outer sides, upturned posteriorly and pointed inwards at the apex; they are much wider in the middle than at the ends; the line of their lower edge is somewhat undulating, with a faint indication of a projecting point posteriorly. They differ very decidedly in form from those of *punctiferella* Wlsm.

Incurvaria politella sp. n.

Antennæ, grayish-fuscous, pubescent in the ♂.

Palpi, mouse-gray.

Head, mouse-gray, sometimes paler towards the thorax.

Thorax, shining, grayish.

Fore-wings, shining, pale grayish, sometimes with a slight æneous tinge, especially in the ♀; the æneous tinge is evenly diffused over the wing-surface; cilia gray along their base, tips whitish.

Hind-wings, gray, rather darker than the fore-wings, with a slight purplish iridescence.

Abdomen, pale grayish-fuscous; uncus, short and obtuse; lateral claspers elongate, wider at the base than apex, with a small projecting excrescence at their upper edge, close to the base, and a well-developed tooth projecting inwards from halfway along their lower edge; the posterior ends are rounded and somewhat turned upwards.

Legs, pale gray.

Exp. al., ♂ 17^{mm}, ♀ 14–15^{mm}.

Habitat, The Dalles, Oregon, April 21, 1872, and Rouge River. Oregon, May 7, 1872.

Types, ♂ ♀, *Mus. Wlsm.*

Incurvaria humilis sp. n.

This is a small, inconspicuous, unicolorous species, of a uniform grayish-brown color. The hind-wings very slightly darker than the fore-wings, owing to an excess of the gray tinge. The legs are scarcely paler. The abdomen is of the same color as the fore-wings. The genital organs are peculiar; a short, obtuse, straight uncus, not bent over, is overshadowed by the strongly upturned lateral claspers, which have the appearance of hooks on either side; they have a slight tooth-like projection below, and a small excrescence above at their base, but are of a totally different shape from those of the larger allied species.

Exp. al., 13–14mm.
Habitat, Crescent City, Cal., 19–21 June, 1872.
Type, ♂, *Mus. Wlsm.*

Incurvaria ænescens sp. n.

Antennæ, whitish at the base, tending to fuscous beyond.
Palpi, whitish.
Head, yellowish-white.
Thorax, fore-wings, and cilia, unicolorous, pale golden-brown.
Hind-wings, purplish-gray; cilia gray.
Abdomen, grayish; lateral claspers, elongate, triangular, upturned, deeply excised beneath, near their base, and with an inwardly projecting short point at their lower extremity; uncus short, obtuse, projected but not hooked.
Exp. al., ♂ 14mm, ♀ 12–13mm.
Habitat, Rogue River, Oregon.
Types, ♂ ♀, *Mus. Wlsm.*
One male, four females, May 7, 1872.

Incurvaria labradoriella Clem.

The type of this species in the collection of the American Entomological Society at Philadelphia had only *one* fore-wing and *one* hind-wing remaining in 1871, and I was somewhat doubtful whether it was a true *Incurvaria*. I have had no recent opportunity of examining the specimen.

Incurvaria acerifoliella Fitch.

The neuration of this species differs from that of the typical *Incurvariæ*, in that veins 5 and 6 of the hind-wings arise from the same stem. The case-bearing habits of the larvæ, rather than the structural appearance of the imago, probably influenced Clemens and Chambers in placing it finally in this genus.

Incurvaria mediostriatella Clem.

=*Lecithocera? flavistrigella* Wlsm.
When describing *Lecithocera? flavistrigella* I was practically unacquainted with *Incurvaria mediostriatella* Clem. The type examined by me in 1871 having only two wings remaining and these much worn, I failed to recognize my species by the description, and was guided chiefly by the long and stout antennæ in placing it in the genus *Lecithocera*. I have now examined the neuration of a specimen and am bound to admit that it does not belong properly to that genus. The apical vein of the fore-wing is furcate near the base, as stated by Clemens, and in this respect it differs from the type of the genus in which he has placed it; nevertheless, I think that the position is approximately correct.

ŒCOPHORA Latr.

Œcophora thoracella sp. n.

Palpi, 2nd joint pale ochreous, shaded with fuscous externally on its basal half: apical joint brownish-fuscous with some pale ochreous scales at about the middle and apex.
Head and face, pale ochreous, shaded with brownish-fuscous above.

Thorax, brownish-fuscous, with a faint purplish tinge, posteriorly fringed with whitish-ochreous.

Fore-wings, remarkably narrow in proportion to their length for this genus, whitish-ochreous; a basal patch, wider on the costal than on the dorsal margin, of a brownish-fuscous color, is followed by a small triangular patch of the same color immediately before the middle of the wing, and this is scarcely separated by a short space on the costa, from a larger patch of the same form immediately beyond the middle; the lower points of these two triangular patches are directed obliquely outwards, at the same angle as that followed by the dorsal extension of the basal patch; the apical portion of the wing is entirely whitish-ochreous with a few scattered brownish scales about the base of the cilia; cilia whitish-ochreous.

Hind-wings, shining, whitish; cilia whitish-ochreous.

Abdomen, shining, pale grayish-ochreous.

Exp. al, 10^{mm}.

Habitat, Colorado.

Type, ♀, *Mus. Wlsm.*

A single female taken by the late H. K. Morrison.

Œcophora dimidiella sp. n.

Antennæ, brown, faintly barred with whitish.

Palpi, dark brown; apical joint tinged with yellowish towards the apex.

Tongue, brown, clothed with brown scales on the basal half; apical half naked, yellowish.

Head, shining, yellowish.

Thorax, deep brown.

Fore-wings, deep brown, with several paler patches; the 1st and most conspicuous lies partly above and partly below the fold, reaching to the dorsal margin at about the basal third of the wing; this is shining pale yellowish (silvery-white wherever the scales have been abraded); on the middle of the costal margin is a smaller silvery-white spot followed by a similar spot at the commencement of the costal cilia; the lower end of the outer spot is bright yellow, it terminates somewhat obliquely before reaching the middle of the wing, its apex being directed towards a similar mixed silvery-white and yellow spot which lies at the anal angle; cilia dark brown; the apical portion of the wing has a somewhat irrorated appearance in the specimen before me (perhaps owing to the abrasion of some of the deep brown scales).

Hind-wings and cilia, dull brown, slightly paler than the fore-wings.

Abdomen, deep brown.

Legs, dull brown, scarcely paler about the tarsal joints.

Exp. al., 16^{mm}.

Habitat, Sonoma County, Cal., May 19, 1871, two females; male, Lake Tahoe, Osten-Sacken, and male, Manitou, Colo. Osten-Sacken (Zell. Coll.).

Type, ♀, *Mus. Wlsm.*

Œcophora coloradella sp. n.

Antennæ, grayish-brown; faintly spotted with paler scales above.

Palpi, brown; whitish on their inner sides; a few paler scales about the outside of the apical joint and at the base of the second joint.

Head, yellowish.

Tongue, whitish.

Thorax, grayish-brown, with a pale streak on each side, the two meeting posteriorly at the base.

Fore-wings, elongate, widened outwardly; costa slightly bulged at the base; straight beyond; apex somewhat depressed, apical margin very oblique, scarcely convex; grayish-brown, dusted throughout with whitish scales; a conspicuous pale-yellow crescent-shaped blotch at the commencement of the dorsal cilia; cilia grayish-brown; neuration very peculiar; the apical vein reaches the costal margin immediately above the apex, and from before its middle sends to the costa a forked branch.

Hind-wings and cilia, pale grayish-brown; veins six and seven parallel, three and four from a point.

Abdomen and legs, pale grayish-brown.

Exp. al., 19 mm.

Habitat, Colorado.

Type, ♂, *Mus. Wlsm.*

A single specimen given me by Mons. Ragonot.

Œcophora pseudospretella Stn.

It is curious that this widely distributed and far too common species should not have been hitherto recorded from the United States. Zeller had four specimens from Washington Territory and I have received it from Vancouver and taken it in California. It has apparently been overlooked in the Eastern States.

I have also a unicolorous bronzy-brown species which should undoubtedly be placed in this genus, but the palpi are broken, and I prefer to wait for better specimens before describing it.

Psecadia zelleriella Chamb.

I feel confident from a careful examination of Chambers's descriptions of his *Hyponomeuta zelleriella* and his *Hyponomeuta texanella* that these two supposed species are one and the same; both descriptions agree perfectly with specimens in my own collection.

The description of *zelleriella*, though earlier than that of *texanella*, is more minute and complete. I have not seen the types.

It is important in this connection to remember that Chambers has also described an *Anesychia texanella* from the same locality. This is evidently a distinct species, and one with which I am not acquainted. His *Hyponomeuta texanella* is obviously a true *Psecadia*, but as it must be dropped in favor of the prior name, *zelleriella*, no confusion need arise from retaining his *Anesychia texanella*, which should also be placed in this genus.

Psecadia discostrigella Chamb.

= *subcœrulea* Wlsm.

When describing *subcœrulea* I was unacquainted with Chambers's *Anesychia discostrigella*, except by the description. A comparison of a series of both species has convinced me that the specimens from Arizona, Utah, and Colorado, which agree with my figure of Chambers's type (in the Museum of the Peabody Academy of Sciences, Salem, Mass.,) are merely darker forms of my Californian species, the name of which must be suppressed as a synonym of *discostrigella*.

Psecadia marmorea sp. n.

Antennæ, brownish, fuscous.

Palpi, recurved, banded with white and brownish fuscous; second joint with a broad brownish fuscous band and a spot of the same color, more strongly marked on the outer than on the inner side; apical joint with two brownish fuscous bands of about equal width on both sides, having the extreme apex and a belt in the middle of the joint white.

Head, whitish, with a conspicuous white spot above the juncture with the thorax; face grayish.

Thorax, white, with four fuscous spots posteriorly: one behind each of the patagia and two on the posterior margin; there is also a similar spot on the anterior portion of the thorax, but the specimen before me is somewhat injured by the pin.

Fore-wings, white, with an irregular brownish fuscous band stretching from the base to the apex, interrupted on the costal margin by two white patches, the second and larger of which is immediateiy beyond the middle of the wing, and contains a single brownish fuscous spot; the brownish fuscous band occupies more especially the costal half of the wing, but encroaches on the white dorsal half by a slight somewhat triangular projection near the base and a larger projection of the same shape about the middle, between and below which is a single circular fuscous spot; immediately above the anal angle are two semi-detached brownish fuscous patches, followed at a short interval by a marginal series of seven dark fuscous spots, extending around the apex of the wing, the upper two being clearly projected upon the white space about the apex, which forms, as it were, another interruption to the fuscous band; cilia above the apex white, below it to the middle of the apical margin brownish fuscous, below which to the anal angle they are again white.

Hind-wings and cilia, pale fawn-gray.

Abdomen, grayish-ochreous; anal tuft ochreous.

Legs, grayish, with some brownish fucous bands across the tarsi.

Exp. al., 21^{mm}.

Habitat, Arizona.

Type, ♂, *Mus. Wlsm.*

A single male in good condition received from Professor Riley, is nearly allied to *Anesychia hagenella* Chamb., but differs in the interruption by the white costal patches of the dark upper half of the wings, as well as in other minor particulars of markings and in the number of the marginal spots.

Psecadia fuscipedella sp. n.

Palpi, grayish fuscous.

Head and antennæ, dull leaden gray.

Thorax, dull leaden gray, with six black spots in two lines converging posteriorly; the first pair at the base of the patagia; second pair nearer to each other at about the middle; third pair nearer still, at the base.

Fore-wings, dull leaden gray, with four black spots; one at the end of the cell; one before it, above the middle of the wing; a smaller one on the fold slightly nearer to the base; and one still nearer to the base below the fold; on the apical margin, and distributed around the apex and anal angle, on the costal and dorsal margins are from nine to eleven small black spots at the base of the dull leaden cilia.

Hind-wings, scarcely paler.

Abdomen, bright ochreous.

Legs, anterior and median grayish fuscous; posterior bright ochreous with the femora tinged with gray, and tarsi dark fuscous tinged with ochreous at the joints.

Exp. al., 21^{mm}.

Habitat, North Carolina.

Type, ♀, *Mus. Wlsm.*

A single female in good condition received from the late H. K. Morrison.

(*To be continued.*)

GENERAL NOTES.

A RECENT BRITISH ENTOMOLOGICAL CIRCULAR.

The Agricultural Department of Great Britain has just issued a three-page circular, probably written by Mr. Whitehead, upon the subject of caterpillars upon fruit trees. Two groups of caterpillars are considered, the one group including the Winter Moth (*Cheimatobia brumata*), the Pale Brindled Beauty (*Phigalia pilosaria*), the Mottled Umber (*Hybernia defoliaria*), and *Hybernia aurantiaria*, all having wingless females and susceptible to the same remedies. The other group includes three insects of more normal habits, viz: The Lackey Moth (*Clisiocampa neustria*), the Ermine Moth (*Hyponomeuta padella*), and the Figure-of-eight Moth (*Diloba cæruleocephala*). The life history of all these species is of course well known in England, and nothing new is suggested in the circular in the way of remedies. The Canker Worm tree-guard of American pattern is recommended for the insects of the first group, while for the second group clean cultivation around the tree, the denuding of the trunk and lower limbs of their outer bark, and the application of soapy and oily compositions and of paraffine and carbolic acid, and the throwing of finely-powdered quicklime on the trees during winter after an attack are the only remedies recommended. No notice is taken of the arsenical mixtures now so popular in this country.

TWO SUGGESTIONS TO STUDENTS OF ENTOMOLOGY.

Some years ago we used the following method for studying the venation of the wings of small *Lepidoptera*. We have told it since to many friends, but believe it has not been published. It is in some respects preferable to the so-called "Dimmock process" and particularly as a time-saver. It is also in this respect preferable to denudation with a brush. The wing is removed and mounted upon a slide in Canada balsam, which should be preferably rather thick. The slide is then held over the flame of an alcohol lamp until the balsam spreads well over the wing. Just as it is about to enter the veins, however, the slide is placed upon ice, or, if in the winter time, outside the window for a few moments. This thickens the balsam immediately and prevents it from entering the veins, which remain permanently filled with air and appear black with transmitted light. With a little practice one soon becomes expert enough to remove the slide and cool it at just the right time, when the scales will have been rendered nearly transparent by the balsam while the veins remain filled with air. We have done this satisfactorily not only with Tortricidæ and Tineidæ, but with Noctuids of the size of *Aletia* and *Leucania*. The mounts are permanent, and we have some which have remained unchanged since 1880. Professor Riley had for some years before this been in the habit of mounting wings in balsam, in which of course the scales cleared after a time.

With Aphids and Coccids, which are covered with an abundant waxy secretion which can not be readily brushed away, we have adopted the plan of melting the wax. We place the insect on a bit of platinum foil and pass it once over the flame of the alcohol lamp. The wax melts at a surprisingly low temperature and leaves the insect perfectly clean for study. This method is particularly of use in the removal of the waxy cocoon of the pupæ of male Coccidæ, and is quicker and more thorough than the use of any of the chemical wax solvents which we have tried.—L. O. H.

THE RELATION OF ANTS TO THE CORN APHIS.

In the August number of the American Naturalist Professor Comstock criticises my note* on the Corn Aphis (*Rhopalosiphum maidis*), as follows:

After narrating several experiments, clearly showing that the ants collect the plant-lice and carry them to the roots of the corn, Mr. Webster makes the following remarkable statement: "These observations led me to conclude * * * that ants, of which three species attend these plant-lice, viz, *Lasius flavus*, *Formica schaufussii*, and *F. fusca*, are not in the least responsible for their distribution over the fields, * * *." We do not think the conclusions of Professor Forbes can be set aside in this way.

My critic will, possibly, pardon me for suggesting that there is nothing remarkable in the statement referred to, nor are the observations of any one set aside. The position taken is simply this:

The Corn Plant-louse owes its distribution to the winged migratory broods, of whose ultimate destination the ants can have no conception and as little control over their movements. The number of individuals may be largely increased through the influence of ants, but there is nothing to indicate that their influence directs the movements of the winged generation. Nor do we see that the ants are any more accountable for the appearance of these winged females in any particular field than is the farmer who produces the corn responsible for its appearance in foreign markets when he disposes of his crop to a local dealer.

In our notice we gave observations showing that as soon as a winged viviparous female alighted on a corn plant and was found by an ant the latter took her in charge, placing her on the roots of the plant, where her progeny were fostered and cared for; that this offspring constituted the generation which was the most destructive to the corn crop; that only in cases of dire necessity were these offspring removed, and all of our attempts to force their removal by the application of substances supposed to be distasteful resulted in failures.

That ants collect the eggs and young of Aphides, carry them to their homes, and even place the young on their food plants, no one can reasonably doubt. But to say that this proves that the Aphides are wholly dependent on the ants for either their existence or diffusion is rather a sweeping assertion.

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* Report Commissioner Agriculture 1887, pp. 148–9.

On two occasions we have observed the winged viviparous females of the Corn Plant-louse, unattended by ants, giving birth to her young on the stems of young corn, below the surface of the ground, the soil being very mellow, and there appears to be no good reason for disbelieving that at least some of these young might have survived. There seems room to doubt, also, that without the aid of ants at least a few young hatching from the eggs might reach their food and survive, although careful experiments had failed to make them do so. Nature has ways of her own of doing things, and in attempting to counterfeit them the most careful experimenter will often find himself at fault.—[F. M. Webster.

INSECTS INTRODUCED INTO CHILI.

Of considerable general interest is a paper by Dr. R. A. Philippi on the changes in the fauna of Chili caused by man* in which he discusses and enumerates the animals that have been voluntarily or involuntarily introduced by man into that country. The paper extends over the whole animal kingdom and teems with interesting details, but we can here only refer to the insects.†

The intentional importations comprise the useful insects, viz: the honey-bee and the silk-worm. The former was introduced in 1848 (the Italian race) and greatly flourishes now in the whole state, so that Chili exports now a large amount of honey and wax. Sericulture was for some time successfully carried on, encouraged by Government subsidy. The climate is eminently fit for this industry, since the mulberry grows finely in the whole country, and since it never rains in the season when the worms are fed. However, a new secretary of agriculture had no interest in the subject; the Government subsidy was withdrawn, the mulberry plantations were cut down, and at present silk raising may be said to have been entirely abandoned even by private persons. The introduction of the Cochenille insect has never been attempted, although it would no doubt flourish in the northern part of Chili.

Coming to the injurious insects, the following have or have not been introduced:

The Phylloxera has not yet reached Chili, but the Apple-blight (*Schizoneura lanigera*) has made its home in this country, having been intro-

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*Ueber die Veränderungen welche der Mensch in der Fauna Chiles bewirkt hat. Festschrift des Vereins für Naturkunde zu Cassel zur Feier seines fünfzigjährigen Bestehens Cassel, 1866, pp. 1–20.

†All these insects are immigrants from Europe and no North American insects have hitherto been introduced into Chili. The Coleoptera we mentioned in the October number (p. 118) as being common to both North America and Chili are not importations, but represent a very ancient natural distribution. In fact all animals mentioned by Dr. Philippi are importations from Europe except the California quail (*Ortyx californica*) which has run wild in the vicinity of Valparaiso, and there is further strong evidence that the *Canis Ingœ* of Peru and northern Chili originates from the North American *Canis occidentalis* or *C. latrans*.

duced about thirty years ago with apple trees from France. It spread rapidly and developed an extraordinary destructive power, so as to seriously threaten the important apple industry of the province of Valdivia. But fortunately the first shock of the invasion was the worst, and the disease has lost in intensity, although there is even now hardly a single apple tree in the country which is free of this pest.

Various species of Coccidæ are now acclimatized in Chili, but most of them affect only the plants upon which they were introduced. Thus we find in Chili *Coccus adonidum*, *C. hesperidum*, *Aspidiotus rosæ*, *A. nerii*. *Aspidiotus lauri* injuriously affects in central Chili the Olive trees and many other plants with leathery leaves, *e. g.*, *Myrtus luma* and *M. ugni*, which are famous for their delicious fruits. Besides these Coccidæ, quite a number of European Aphids have also permanently settled, but not a single species of the many Lepidoptera* and Coleoptera, injurious to growing cultivated plants and trees, has ever been introduced with its food-plant. Thus, there are never any caterpillars nor flea-beetles on the Chilian cabbage; there are no wormy apples, pears, plums [prunes ?]; there are no Canker Worms, Cut-worms, no Tent Caterpillars and no Pea Weevils.

Of other injurious Coleoptera very few have found their way to Chili; *Sitodrepa panicea*, the well-known Herbarium pest, *Corynetes violaceus*, the Bone Beetle, and *C. ruficollis*, the Ham Beetle, are economically not very important. Two grain-weevils occur, *Calandra oryzæ* and *C. granaria*, the damage done by the latter being often enormous; but another grain pest, *Tinea granella*, has never been heard of in Chili. In houses, *Tinea biseliella* (*crinella*) is very common, feeding on carpets. Several European Dermestidæ are from time to time brought over in ships, but do not seem to flourish in Chili; their places are occupied by native species, and the Chilian *Eurhopalus variegatus* is fully able to dispose of any insect collection so as to need no assistance from the kindred European *Anthrenus*. *Tenebrio molitor* has in quite recent years been intentionally introduced, the larva being used as birds' food, but has not yet spread further.

As a matter of course, *Blatta germanica* is also not rare, but Dr. Philippi found it only in the woods and is inclined to consider it as autochthonous.

The parasites of man, viz, the flea, the bed-bug, and the three species of lice, are just as common in Chili as elsewhere. The fleas and the lice no doubt accompanied the first human immigrants to Chili, while the bed-bug came in all probability only after the arrival of the Spaniards; even to-day it is still absent in the province of Valdivia and in the country of the Araukanians. The flea occurs in Chili as elsewhere only up to an altitude of 5,000 feet. The Jigger, *Sarcopsylla penetrans*, which is a considerable annoyance along the coast of Peru, occurs nowhere in Chili.

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* *Plusia gamma* which occurs in Chili is claimed by Dr. Philippi as an endemic species.

The house-fly is, in Chili, the same common and annoying companion of man as elsewhere, and the question whether or not it existed before the arrival of the Europeans will never be answered. *Stomoxys calcitrans* is rather scarce in Chili, and Dr. Philippi observed it first twenty years ago; it is not mentioned in Gay's work.

With the introduction of domestic animals some of their insect parasites have also come to Chili. The sheep-tick (*Melophagus ovinus*) was introduced at a very early period, but the sheep gad-fly (*Œstrus ovis*) exists in Chili only since about twenty-five years. *Œstrus bovis*, occasionally introduced in breeding cattle, has hitherto not taken a firm hold on Chilian soil. *Œstrus equi* and *Hipposboca equina* have never been found in the country nor has Chili any native species of that family. The chicken and pigeon have also added their parasitic Acari (*Acarus gallinæ* and *Argas reflexus*) to the Chilian fauna.

The Red Spider (*Tetranychus telarius*) has become extremely numerous and injurious in Chili, but it is interesting to note that in the southern provinces, *e. g.*, Valdivia, where rains are frequent and abundant, this pest has never been found. Whether the Itch Mite (*Acarus scabiei*), which is especially common on the island of Chiloe, is to be considered as an endemic insect or as an importation by the Spaniards can never be satisfactorily decided.

We mentioned above that *Plusia gamma* and *Blatta germanica* are considered by Dr. Philippi as endemic forms, and to those must be added *Ophion luteus* and *Acridium tesselatum*, which according to Prof. Carlos Berg is different from *A. migratorium*, a question which is, however, still an open one. However that may be, any grasshopper damage in Chili is never done by *A. tesselatum*, but by the much smaller *Œdipoda cinerascens*. But since more than forty years there was never any damage worth mentioning done by grasshoppers, whereas still at the beginning of this century such invasions took place several times in the vicinity of Santiago. But since that time the enormous increase of the cultivated area, in consequence of the construction of numerous irrigation canals, has forever prevented an undue multiplication of the grasshopper.

REMARKABLE ABUNDANCE OF THE CECROPIA SILK-WORM.

Miss Clara E. Brown, of Calaway, Custer County, Nebr., writes to the Commissioner of Agriculture, under date of October 5, sending specimens of the Cecropia cocoon, and stating that the worms commit great havoc among the timber claims of that section, and that the cocoons are to be found in vast numbers this fall fastened to the limbs of the trees. She also found them fastened to a bush which they call the "Shoe-string" (*Amorpha canescens*) in that country. Her object in sending was to see whether they could be made of any commercial value, but, as is well known, the difficulty in reeling the silk prevents this.

THE CLOVER-ROOT BORER.

As has been pointed out by Mr. James Fletcher, this insect has become known of late years in Canada, and we learn from an item in the Rural New Yorker for September 15 that it has been found upon the Rural farm on Long Island. This destructive enemy of the clover plant is a slow spreader, and it is very fortunate that this is the case, as it is a very difficult enemy to fight.

A POINT IN FAVOR OF THE ENGLISH SPARROW.

Mr. J. G. Cooper, writing to the Pacific Rural Press of September 8, 1888, records the destruction of the Woolly Aphis upon his apple trees by a large flock of young English sparrows, but is inclined to think that it was due to the excessive dry weather, causing a scarcity of their usual food.

THE REAR-HORSE DOMESTICATED.

Many of the old office desks in the Department of Agriculture here at Washington have become badly infested with Roaches and Croton Bugs, which feed upon almost everything left in the drawers. One of the assistants in the Entomological Division was paying a visit some days since to a lady employed in one of the other divisions, and to entertain him she showed him what she called her "entomological pet." This was a handsome female specimen of *Mantis carolina* which she had captured and domiciled upon her desk and fed with roaches until it had become reconciled to its position. At the date of the visit the Mantis seemed perfectly at home and the original insect inhabitants of the desk were rapidly becoming less numerous. This practical application of entomological knowledge is highly to be commended and greatly encourages the entomologists of the Department in their labors to diffuse knowledge of the habits of insects!

A CALIFORNIA ENEMY TO WALNUTS.

Mr. Coquillett, writing us under date of April 16, gives an account of a Tortricid larva which does a great deal of damage to Walnuts near Los Angeles. We quote his note as follows. The description of the larva comes first:

Body green, sometimes tinged with yellow; piliferous spots lighter; spiracles ringed with brown or black; cervical shield greenish, irregularly bordered behind with black; head yellowish; a black or brown dot on each side of face, another on lower part of clypeus; a black or brown triangle on each lobe of the head; sides of head broadly and irregularly bordered with black or brown. Body nearly naked, provided with 16 legs. Length 14^{mm}. Lives singly in the green nuts of *Juglans californica*. They usually enter the green nut near the stem end, and make from one to three holes in it, out of which they push their black excrements, which collect in a conspicuous heap at the mouth of each hole. After eating out the interior of one of the nuts the larva deserts it and eats its way into a second nut, and this it continues until reaching its full growth. In the breeding cage the full-grown larvæ de-

serted the nuts and crept beneath the litter in the bottom of the cage, where they spun tough, grayish cocoons. The larvæ were found on the 8th of May, spun their cocoons in June, and the moths issued on the following dates: March 4, 12, 13 (four), 15, 18, 24 (two), 25 (two), 27, and 29 (two).

Fully five-sixths of all of the walnuts growing upon the trees on one of the hills near the city of Los Angeles were or had been infested by one of these larvæ They enter the nuts when the latter are from a half to three-fourths of an inch in diameter.

The moth is very close to *Proteopteryx emarginana* Wlsm., but is nevertheless distinct, and it may be a new species; but this point we shall decide after receiving a larger series of adults.

LITTLE KNOWN ENEMIES OF THE POTATO PLANT IN NEW YORK.

The occurrence of the Cucumber Flea-beetle, *Crepidodera cucumeris* Harris, in immense numbers in the potato fields of New York the present season has, no doubt, resulted in much damage to the crop. But as the beetles were associated with *Cosmopepla carnifex* Fab. in this work of destruction in western New York, a similar state of affairs may have existed elsewhere, and the damage have been entirely attributed to the beetles. This fact would be of economic importance, as a remedy that might be effective in fighting the one might be worthless in destroying the other.

Singularly enough, the only locality where the species under consideration has previously been reported as injuring the potato was in Livingston County also, it having been sent to Professor Lintner from Souyea about the middle of July, several years ago, and mentioned by him in his second report as State entomologist of New York, p. 144. Professor Lintner also states that the same insect was reported very injurious to the fruit of the Currant about Montreal, Canada, in 1884, where it reappeared the following year in still greater numbers.

On August 9, 1888, Prof. James Troop, of La Fayette, Ind., sent me specimens of *Cosmopepla carnifex* from Livonia, Livingston County, N. Y., with the information that they were swarming on the potato tops, especially among the curled leaves, which they punctured, these leaves afterwards withering up, turning black, and ultimately falling off, evidently to the serious detriment of the crop. When placed in the box in which they were sent to me the insects were nearly all yet in the pupal stage, but on reaching me, on the 12th, only one pupa appeared, the remainder having reached the adult stage, and in one instance the female had oviposited on one of the inclosed leaves.

The bugs were transferred to new quarters and given fresh plants, upon which they subsisted continually till the 24th, when they were killed and preserved.

Prof. Herbert Osborn, of Ames, Iowa, tells me that he has observed these bugs on the foliage of the grape, and very kindly forwarded me specimens of the eggs for comparison with those obtained by myself.

The egg is four-fifths of a millimeter in length and three-fifths of a millimeter in diameter, cupuliform, with a ring of about 16 long, slen-

der, sinuous, white appendages resembling spines, except that the ends are knobbed. These are bent so as to point outward. The whole surface of the egg is covered with minute short spines, these being longer and more thickly placed within the ring. The natural color is dark bronze-brown, but alcoholic specimens are of a dull white color, the minute spines of brown showing distinctly on the surface. The eggs are placed in clusters, the ringed end upward, resembling a cluster of minute cups.—[F. M. Webster.

PROFESSOR FORBES' INVESTIGATION ON THE FOOD OF FRESH-WATER FISHES.

The number of insects which are known to feed on fishes is very limited, and these few could probably subsist on mollusks or other food, and are thus not dependent on a fish diet. On the other hand, a large proportion of fresh-water fishes depend more or less completely on insects as food, and could, therefore, not exist without the insects. To show the importance of insects as one of the principal food-articles of fresh-water fishes has been the object of Prof. S. A. Forbes in a series of admirable papers on the food of fresh-water fishes of Illinois. These papers have been published under various titles in the Bulletin of the Illinois State Laboratory of Natural History (Vols. I and II), between the years 1877 and 1888. The wide scope of these investigations becomes at once apparent from the fact that no less than 1,221 fishes, belonging to 87 species of 63 genera and 25 families, and taken in various months of the year from April to November, were carefully examined, and the food contained in their stomachs determined and classified. In the concluding portion of the series, which has just been published as Article VIII of Volume II of the Bulletin, Professor Forbes presents the summary of his researches and the generalizations derived therefrom. This summary concludes with a classified list of the objects detected in the food of fishes, occupying 28 pages, and the list of insects occupies nearly 13 pages.

This list is of great interest to the entomologist, not only from the species it contains, but also from the many very common species which are absent therefrom, and we regret that on account of its length we can not reproduce it here entire. We quote, however, Professor Forbes' equally interesting general remarks on the food of adult fishes so far as they pertain to the insectivorous species:

"It is from the class of insects that adult fishes derive the most important portion of their foo l, this class furnishing, for example, 40 per cent. of the food of all the adults which I examined.

"The principal insectivorous fishes are the smaller species, whose size and food structures, when adult, unfit them for the capture of Entomostraca, and yet do not bring them within reach of fishes or Mollusca. Some of these fishes have peculiar habits, which render them especially dependent upon insect life, the little minno v *Phenacobius*, for example,

which, according to my studies, makes nearly all its food from insects (98 per cent.) found under stones in running water. Next are the Pirate Perch, *Aphredoderus* (91 per cent.), and the Darters (87 per cent.), the Croppies (73 per cent.), half-grown Sheepshead (71 per cent.), the Shovel Fish (59 per cent.), the Chub Minnow (56 per cent.), the Black Warrior Sunfish (*Chænobryttus*) and the Brook Silversides (each 54 per cent.), and Rock Bass and the Cyprinoid genus *Notropis* (each 52 per cent.).

"Those which take few insects or none are mostly the Mud-feeders and the Ichthyophagous species, *Amia* (the Dog-fish) being the only exception noted to this general statement. Thus we find insects wholly or nearly absent from the adult dietary of the Burbot, the Pike, the Gar, the Black Bass, the Wall-eyed Pike, and the great river Catfish, and from that of the Hickory Shad[1] and the Mud-eating Minnows (the Shiner, the Fat-head,[2] etc.). It is to be noted, however, that the larger fishes all go through an insectivorous stage, whether their food when adult be almost wholly other fishes, as with the Gar and the Pike, or mollusks, as with the Sheepshead. The Mud-feeders, however, seem not to pass through this stage, but to adopt the limophagous habit as soon as they cease to depend upon Entomostraca.

"Terrestrial insects, dropping into the water accidentally or swept in by rains, are evidently diligently sought and largely depended upon by several species, such as the Pirate Perch, the Brook Minnow, the Top Minnows or Killifishes (Cyprinodonts), the Toothed Herring, and several Cyprinoids (*Semotilus*, *Pimephales*, and *Notropis*).

"Among aquatic insects, minute slender dipterous larvæ, belonging mostly to *Chironomus*, *Corethra*, and allied genera, are of remarkable importance, making, in fact, nearly one-tenth of the food of all the fishes studied. They are most abundant in *Phenacobius* and *Etheostoma*, which genera have become especially adapted to the search for these insect forms in shallow rocky streams. Next I found them most generally in the Pirate Perch, the Brook Silversides, and the Stickleback, in which they averaged 45 per cent. They amounted to about one-third the food of fishes as large and important as the Redhorse and the River Carp, and made nearly one-fourth that of fifty-one Buffalo fishes. They appear further in considerable quantity in the food of a number of the Minnow family (*Notropis*, *Pimephales*, etc.), which habitually frequent the swift water of stony streams, but were curiously deficient in the small collection of Miller's Thumbs (*Cottidæ*), which hunt for food in similar situations. The Sunfishes eat but few of this important group, the average of the family being only 6 per cent.

"Larvæ of aquatic beetles, notwithstanding the abundance of some of the forms, occurred in only insignificant ratios, but were taken by fifty-six specimens, belonging to nineteen of the species, more frequently by the Sunfishes than by any other group. The kinds most

[1] *Dorosoma*. [2] *Pimephales*.

commonly captured were larvæ of Gyrinidæ and Hydrophilidæ; whereas the adult surface beetles themselves (*Gyrinus*, *Dineutes*, etc.), whose zigzag-darting swarms no one can have failed to notice, were not once encountered in my studies.

"The almost equally well known slender Water-skippers (*Hygrotrechus*) seem also completely protected by their habits and activity from capture by fishes, only a single specimen occurring in the food of all my specimens. Indeed the true Water-bugs (Hemiptera) were generally rare, with the exception of the small soft-bodied genus *Corisa*, which was taken by one hundred and ten specimens, belonging to twenty-seven species, most abundantly by the Sunfishes and Top Minnows.

"From the order Neuroptera fishes draw a larger part of their food than from any other single group. In fact, nearly a fifth of the entire amount of food consumed by all the adult fishes examined by me consisted of aquatic larvæ of this order, the greater part of them larvæ of Day Flies (Ephemeridæ), principally of the genus *Hexagenia*.[1] These Neuropterous larvæ were eaten especially by the Miller's Thumb, the Sheepshead, the White and Striped Bass, the common Perch, thirteen species of the Darters, both the Black Bass, seven of the Sunfishes, the Rock Bass and the Croppies, the Pirate Perch, the Brook Silversides, the Sticklebacks, the Mud Minnow, the Top Minnows, the Gizzard Shad, the Toothed Herring, twelve species each of the true Minnow family, and of the Suckers and Buffalo, five Catfishes, the Dogfish, and the Shovel Fish—seventy species out of the eighty seven which I have studied.

"Among the above I found them the most important food of the White Bass, the Toothed Herring, the Shovel Fish (51 per cent.), and the Croppies; while they made a fourth or more of the alimentary contents of the Sheepshead (46 per cent.), the Darters, the Pirate Perch, the common Sunfishes (*Lepomis* and *Chænobryttus*), the Rock Bass, the Little Pickerel, and the common Sucker (36 per cent.).

"Ephemerid larvæ were eaten by two hundred and thirteen specimens of forty-eight species, not counting young. The larvæ of *Hexagenia*, one of the commonest of the 'River Flies,' was by far the most important insect of this group, this alone amounting to about half of all the Neuroptera eaten. They made nearly one-half of the food of the Shovel Fish, more than one-tenth that of the Sunfishes, and the principal food resource of half-grown Sheepshead; but were rarely taken by the Sucker family, and made only 5 per cent. of the food of the Catfish group.

"The various larvæ of the Dragon Flies, on the other hand, were much less frequently encountered. They seemed to be most abundant in the food of the Grass Pickerel (25 per cent.), and next to that in the Croppie, the Pirate Perch, and the common Perch (10 to 13 per cent.).

[1] The winged adults of this and related genera are often called "River Flies" in Illinois.

"Case-worms (*Phryganeidæ*) were somewhat rarely found, rising to 15 per cent. in the Rock Bass, and 12 per cent. in the Minnows of the *Hybopsis* group, but otherwise averaging from 1 to 6 per cent. in less than half of the species."

THE HOSTS OF A FEW LARGER ICHNEUMONIDS.

We had occasion last May, in writing to Mr. Clarence M. Weed concerning his recently-published paper, "Biological Notes on Some North American Ichneumonidæ" (Psyche, Vol. V, No. 145, May, 1888), to bring together the records from our note-books of the habits of several of the species mentioned by him, in order to supplement his short list. As these facts have not been published we give them below as a matter of record:

Pimpla notanda	Proteoteras æsculana.
	A Leaf-roller on Locust (not reared).
Pimpla annulipes	Carpocapsa pomonella.*
	Phycita nebulo.*
	Papilio ajax.
	Datana ministra.
	Tortrix quercifoliana.
	A Leaf-roller on Strawberry (not reared).
	Teras oxycoccana.
	Heterocampa marthesia.
	Gelechia gallæ-asterella.
Pimpla conquisitor	Aletia xylina.*
	Clisiocampa americana.
	Thyridopteryx ephemeræformis.*
	Phycita nebulo.*
Pimpla inquisitor	Orgyia leucostigma.*
	Gelechia gallæ-solidaginis.
	Grapholitha olivaceana.
	Coleophora cinerella.
	Leaf-roller on Ash (not reared).
Trogus obsidianator ...	Papilio asterias.
Trogus exesorius	Papilio ajax.
	Papilio marcellus.
	Papilio asterias.*
	Papilio troilus.*
	Papilio turnus.*
Ichneumon rufiventris .	Pyrameis cardui.*
	Pyrameis huntera.
	Vanessa milberti.

* Those records with an asterisk have been published in our accounts of these species. We may further mention that Professor Comstock in 1879 reared *P. conquisitor* from *Phacellura hyalinitalis*, and that we have more recently reared *P. annulipes* from a *Chilo* near *oryzæellus*, which we have reared from twigs of sumach at Washington.

November 1, 1888.—Mr. Schwarz read and commented upon a passage in Garzilasso de la Vega's account of DeSoto's expedition, relative to silk-culture in Mexico in the earlier part of the fifteenth century, and offered some remarks on the absence of any reference by that old author to the various insect pests annoying man, with which the Spaniards must have come in contact for the first time during DeSoto's march through North America.

Mr. Fox read some notes on the spiders collected by him in Tennessee during the past summer. He especially commented on the habitat of a species of *Dolomedes* taken by him, and upon the tube of *Lycosa nidifex,* which is different from that described by Dr. Marx in his description of the species. Dr. Marx made some remarks on the paper, and gave the burrowing habits of *Lycosa nidifex* as observed by him near the seashore. He also suggested that this is a good time to collect gossamer spiders, which are now very abundant.

Mr. Howard suggested the collection of spider egg masses for the purpose of trying to get parasites.

Professor Riley suggested that the larva of *Mantispa* can be obtained in the same way. He also made some remarks on the habits of a species of *Agalena* common on his grounds. He further made some remarks on the habits of *Atypus.*

Mr. Smith made some remarks on the habits of *Stomoxys* as observed by him at his residence. He says neither he nor any member of his family have been bitten by them, although they have now entirely replaced the *Musca domestica.* They are not attacked by the fungus which is rapidly killing the few remaining specimens of *M. domestica.*

A discussion of the habits of *Stomoxys* was participated in by Messrs. Mann, Smith, Riley, Schwarz, Howard, and Alwood.

Mr. Schwarz made a series of shorter communications on the following insects, of which specimens were exhibited: On *Dendroctonus simplex* attacking *Larix Americana,* and on the other Scolytids atttacking the Tamarack; on the secondary characters in the male of *Pissodes affinis;* on a new Herbarium pest from California (*Trigonogenius sp.*), on the hitherto unknown female of *Photinus collustrans;* on a specimen of *Sinoxylon basilare* with two-jointed antennal club, and on the occurrence of *Sinoxylon texanum* near Washington. A discussion arose between Messrs. Riley, Howard, Schwarz, and Smith on the constancy of the number of antennal joints in insects and their value in classification.

JOHN B. SMITH,
Recording Secretary.

FIG. 35. *Chalcis flavipes.*

PERSONNEL OF THOSE ENGAGED IN GOVERNMENT ENTOMOLOGICAL WORK.

The following list embraces those now engaged in Government entomological work, and who will assist in the management of the periodical, those at Washington editorially, and the others as contributors. The force of the Division of Entomology is more or less inconstant, as it consists of both permanent and temporary employés:

DIVISION OF ENTOMOLOGY, U. S. DEPARTMENT OF AGRICULTURE.

Entomologist: C. V. Riley.

Office Staff: L. O. Howard, First Assistant; E. A. Schwarz, Th. Pergande, Tyler Townsend, W. B. Alwood, Assistants; Philip Walker, Assistant in silk-culture and in charge of reeling experiments.

Field Agents: Saml. Henshaw, Boston, Mass.; F. M. Webster, Lafayette, Ind.; Herbert Osborn, Ames, Iowa; N. W. McLain, Hinsdale, Ill.; Mary E. Murtfeldt, Kirkwood, Mo.; Lawrence Bruner, Lincoln, Nebr.; D. W. Coquillett, Los Angeles, Cal.; Albert Koebele, Alameda, Cal.

DEPARTMENT OF INSECTS, U. S. NATIONAL MUSEUM.

Honorary Curator: C. V. Riley.

Assistant Curator: John B. Smith.

☞ For bibliographical purposes it may be necessary to state that, where expedient, the names or initials of members of the force will be attached to their communications. Where initials alone are appended, the full name can be ascertained by referring to the list above given.

Editorial or unsigned articles or notes should be credited to "Insect Life," or where it is desired to give personal credit, to "Riley and Howard." While most of the correspondence of the Division is carried on by myself, yet much of it is also attended to by my first assistant, Mr. Howard, who acts as Entomologist in charge during my absence, and otherwise so materially assists in editorial and office work that only those articles signed by either should be considered individual. Illustrations, where not otherwise stated, are drawn by Miss Lillie Sullivan, under supervision.—C. V. R.

U. S. DEPARTMENT OF AGRICULTURE.

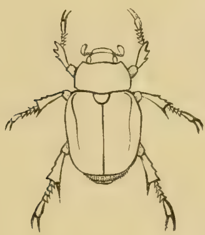
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. DECEMBER, 1888.

Vol. I. No. 6.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS, WITH THE SANCTION OF THE COMMISSIONER OF AGRICULTURE.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1888.

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SPECIAL NOTES.

The notices so far published of INSECT LIFE have been very satisfactory indeed, and we feel very much encouraged at the manner in which the bulletin has been received both by entomologists and farmers. The only strictures so far made have been in reference to publication of descriptive matter. We wish to assure our reviewers that while in the main INSECT LIFE will be devoted to the economy of insects, it is also devoted to the promotion of entomology in all its branches. We do not intend to print hurried, isolated descriptions, carelessly thrown together and hastily published to insure priority, but where descriptions form a part of some comprehensive study of any group of insects; where they are based upon a broad knowledge of affinities, or where they are connected with any studies in life history, we shall be glad to give them place. We hope, therefore, to publish some matter of this kind with almost every number of the bulletin.

Recent California Work against the Fluted Scale.—On page 110, No. 4, INSECT LIFE, we published an extract from a letter received during September from Mr. Coquillett, giving a vivid account of the condition of affairs among orange-growers in southern California. One prominent fruit grower has entirely abandoned the industry; another one stated that he would cut down his trees in case he could not make a success of the gas treatment; another took all the money that the oranges and lemons brought him and spent it in spraying his trees with "one of the best caustic washes in use" (!), and as a result his trees were injured to such an extent that they will not bear this year, while the scales are as abundant as ever. Other growers in the San Gabriel Valley state that they were seriously thinking of abandoning their citrus groves. This sad state of affairs is, as we stated eighteen months ago in our Riverside address, by no means necessary. While experiments have shown that the fumigating processes will kill the insects, still they are expensive and elaborate, and our orange-growing friends do not seem to have a proper appreciation of the washes which we have recommended.

It is our firm belief, founded upon personal observation in California, that thorough and persistent work with any one of a half dozen of the kerosene and resin compounds will prove satisfactory. So far as we can learn they have by no means received a fair trial. The experiments made by Mr. Koebele in 1886 and 1887 have demonstrated the efficacy of certain of these washes to our entire satisfaction, and we feel positive that we could keep a young grove comparatively free in the worst infested district at an expenditure which would not be excessive. Where the insect has attained a firm foot-hold in an old grove, it is of course very difficult to eradicate; but young groves can be protected, and in our opinion the horticulturists are making a very great mistake in entirely dropping the washes and devoting so much time to the expensive cyanide-gas treatment. We do not understand, after what has been definitely proved in this direction, how such a vital mistake could have been made as indicated in the case of the man who spent all his money on the caustic washes and seriously injured his trees. Nor can we sympathize so much as we otherwise would with those who have felt themselves obliged to abandon the cultivation of oranges and lemons.

A correspondent in California, wishing to use the fumigation process for destroying orange scales, was informed by the proprietors of an apparatus for confining the fumes that they possessed patents not only upon their mechanical devices but also upon the process of fumigation. Upon receiving word from our correspondent of this state of affairs we took occasion to look the matter up, and came to the conclusions indicated in the following sentences which are extracted from our final reply:

I have had a most careful examination made at the Patent Office here in Washington, with the result that, while I readily find the record of the issuing of a patent to the Culver-Keach people for their apparatus, I can not find the slightest trace of a patent on the "process of fumigation with gas" issued to these people. This claim is probably set up by them for the purpose of keeping other parties out of the field. Moreover, the Patent Office has decided in the case of other parties that the "process" can not be patented, since the so-called Hatch patent covered the same ground, and as this patent has expired the process has become public property. The essential features of the gas treatment were discovered by Mr. Coquillett as an outgrowth of the work he was doing for the Government under my direction, and the results have been made public and are public property. So long as you do not infringe on the mechanical principles used in the fumigator you need, in my judgment, pay little heed to claims for gas treatment.

Introduction of living Parasites: Success of the Mission to Australia.—We had intended publishing in our general notes of this number a quotation from the *South Australian Register* of October 27, giving an account of the apparent success of the mission of Mr. Koebele, one

of our agents, whom we sent to Australia for the purpose of studying and collecting the native parasites of *Icerya purchasi* with a view of introducing them into California; but just as we are going to press the Australian mail arrives, and the following letter from Mr. Koebele covers the ground so much more satisfactorily that we print it in full:

So far my work has been much more successful than I expected. I not only found the dipterous parasite within Icerya in large numbers, but also three predaceous larvæ feeding upon the eggs of Icerya. One of these is a Chrysopa larva, which I first discovered in numbers, it having almost destroyed all the eggs of the infested Icerya at Mannam, 28 miles up the Murray River from Murray Bridge Station, South Australia; the others are larvæ of a small Coccinella. I have collected and sent with this steamer, *Mariposa*, probably 10,000 Iceryæ, of which at least 50 per cent. are infested with the dipterous larvæ and pupæ. Dr. Schomburg, director of the Botanical Gardens of Adelaide, kindly furnished me with a wardian-case, in which I placed three young orange trees and nine of Pittosporum, securely packed down. The Iceryæ were placed in this on sticks of orange placed in earth, so the smaller, half-grown insects can easily crawl up on the fresh plants, and the flies that hatch *en route* may be able to go on breeding. Beside these, I send a large lot in tin and wooden boxes, chiefly taken off of twigs; these latter I have placed in ice-box, so that none will be able to hatch during the voyage. As it looks now, for all are on steamer already, the latter experiment will be the best to follow. Notwithstanding the care and labor I have spent in getting this case here in such condition, I fear that the packages will suffer greatly through the handling of the steamer hands. However it may be, I assure you that success will attend your effort, and I expect to land several thousands of flies in pupa state with every steamer landing at San Francisco.

In regard to the case with plants, this is a bulky thing, weighing 240 pounds, while the same number of scales packed in boxes would make only a few pounds.

The most difficult matter is to get Iceryæ in such large numbers. As yet I have found them only in private gardens, but I know of sufficient for another sending.

On coming on here I also discovered the flies within Iceryæ in Victoria, and am certain that they will be found all over Australia, or wherever Icerya is present.

They are not only parasitic upon Monophlœbus and Icerya, but I am almost certain also upon Dactylopius. I found many empty puparia within dried-up Dactylopius, and also have several fresh ones at Adelaide.

Will remain in New South Wales for about a week or so and make a careful examination of the ground, then proceed to Victoria in search of Icerya, but will be in Adelaide in time to make up a larger shipment.

Economic Entomology in India.—An esteemed correspondent writes us from Calcutta with regard to INSECT LIFE as follows:

I am much interested in your new venture "Insect Life," which is the practical carrying out of a scheme that I have been urging on our people here for years. This is what a practical man wants, the history of an insect and a name or ticket by which it can be recognized by others and by which their observations can be correlated and made use of for all time. In all countries economic entomology must have more attention paid to it than hitherto. Competition and pressure of population both demand every effort of science to reduce the cost of production, and it can be done to a greater extent than has hitherto been thought of. I have encouraged an assistant in our museum to *précis* and distribute your papers. But it is slow work and I should be glad of any papers on the organization of your Department, to found a similar one here. No paid agency can be entertained for other than the scientific work, and

we lack the intelligent unpaid agency which forms the feature of your reports and which gives you what no reasonably paid agency could accomplish. This is my great difficulty: the Indian peasant knows nothing of insects or means to combat them, and is too ignorant and careless to help. There is not one native of India who knows anything of natural history or cares for it or is likely to do so.

———

Credit to whom Credit is due.—We are sorry to notice from the *Garden and Field* (Adelaide, South Australia) for July, 1888, that Mr. F. S. Crawford, to whom is due the discovery of *Lestophonus iceryæ*, the Dipterous parasite of the Fluted Scale, and who has taken so much trouble to secure specimens to forward them to California and New Zealand, is somewhat hurt by an exhibition of want of knowledge of the facts on the part of a California paper. He quotes from the California journal as follows:

To Professor Coquillett, Mr. Wolfskill, and Mr. Craw great praise is due, for they are in a fair way to do more for Southern California than has been accomplished in many years.

Following this, in his own words, he adds:

All honor, then, be to this patriotic trio, and personally let me express my compliments to the writer of the article, because until I read it I labored under the delusion that I first discovered th Dipteron, that I first suggested its introduction into California and other countries afflicted by the Icerya scourge, and that I have put myself to some little and my friends to much greater trouble in collecting and forwarding the Coccid hosts of these parasite flies—all of which is doubtless a mistake!

We are very sorry that Mr. Crawford feels hurt about this matter, and beg to assure him that it is but a specimen of a certain kind of American journalism for which. in all probability, no one of the three gentlemen in question is in the least responsible. Mr. Crawford's claims upon the gratitude of the California people are well known and abundantly recognized. Our own part in this matter is equally ignored in the article referred to. In our Riverside address, in the spring of 1887, we made use of the following words:

It has doubtless occurred to many of you that it would be very desirable to introduce from Australia such parasites as serve to keep this Fluted Scale in check in its native land. We have a ready seen that there is one minute parasite which has, in all probability, been brought over with it from Australia, and there is no question but that it is very desirable to introduce any such of its enemies and parasites as can be introduced. This State—yes, even Los Angeles County—could well afford to appropriate a couple of thousand dollars for no other purpose than the sending of an expert to Australia to devote some months to the study of these parasites there and to their artificial introduction here.

Receiving through Miss Ormerod the first specimens of Lestophonus, we requested Mr. Crawford to send specimens to Messrs. Coquillett and Klee. We have recently learned that Mr. Klee also independently made the same request to Mr. Crawford after learning that such a parasite existed. The California newspaper man was singularly unfortu-

nate in that none of the three gentlemen whom he mentioned had anything to do with the matter beyond receiving the specimens and attempting to colonize them.

Entomologiske Meddelelser, udgivne af Entomologisk Forening ved Fr. Meinert, Copenhagen.—This is the title of a new journal, of which we have received the first five numbers through the Smithsonian Institution. The name of its editor is a guaranty of the excellence of its contents, a large proportion of which are from his pen. Unlike English journals, this paper contains no prospectus, no price, no indication as to where it is to be obtained, and no date except that of the year. It is printed in good style, on good paper, and in the Danish language exclusively. In the numbers before us there seems evident an intention of giving as complete a list of the Danish insect fauna as possible. The Orthoptera have been completed and the Coleoptera are making good progress. We are glad to greet a new friend.

The *Rural New Yorker* potato contest has been decided and the so-called Rural Seedling No. 2 yielded at the rate of 1,076 bushels to the acre. No. 3 lost the day and was nearly a failure on account of the ravages of the common Flea-beetle (*Crepidodera cucumeris*). Probably the yield of No. 2 would have been greater but for this cause. This insect has been particularly destructive during the past season upon the Rural farm, confining its attack to the leaves and terminal shoots.

It is now proposed to start a potato contest for ladies, the patches to be limited to one-fortieth of an acre or thereabouts. The details, however, are not fixed.

We have received from Prof. Dr. K. Lindeman, of Moscow, a report upon the diseases of tobacco in Bessarabia. The report, unfortunately for American students, is published in Russian and not in the German, in which Professor Lindeman usually writes. He discusses principally the Tenebrionid beetle, *Opatrum intermedium*, a species which is confined to southern Russia, and the larva of which attacks the stem underground. The larva also feeds upon wheat, Atriplex and Convolvulus. He also discusses the injury done by a Thrips (*Thrips tabaci*) and another Tenebrionid—*Pedinus femoralis*.

We have received from George W. Peckham and Elizabeth Peckham a paper entitled "The North American Spiders of the Family Attidæ," which has the appearance of a careful and most conscientious work.

Rev. T. A. Marshall writes us that E. André, of Beaune, is now engaged in compiling a new catalogue of the Hymenoptera of Europe and adjacent countries, every part of which will be submitted to specialists before publication, and which doubtless will for a time prove serviceable to working Hymenopterists.

The Buhach Producing and Manufacturing Company, of Stockton, Cal., very generously offered to sell the Department some time ago seed of *Pyrethrum cinerariæfolium*, at the following rates: One pound, $50; 5 pounds, $200; 10 pounds, $350; 50 pounds, $1,250; which shows that there is money in the cultivation of this insecticide plant in the United States. We have already shown that the plant can be successfully grown over a large portion of the country and it seems remarkable that this firm should have enjoyed a monopoly so long.

We are anxious to get copies of our First and Sixth Reports on the Insects of Missouri. We shall be pleased to purchase them of any of our readers who happen to have copies that they can spare. We desire these two reports more particularly. The first is published in the Report of the State Board of Agriculture for 1868, and we will purchase copies of that report where the entomological part is not separated. The Sixth Entomological Report was published separately. We are also willing to purchase the entomological reports for any other years.

THE HABITS OF THALESSA AND TREMEX.

By C. V. Riley.

HABITS OF THALESSA.

Our two largest American Ichneumonids (*Thalessa atrata* and *T. lunator*) have long been known to bore the trunks of various trees with their lengthy ovipositors, choosing, apparently, only trees or stumps inhabited by Tremex or other wood-boring larvæ, from which the general supposition has been that the larvæ of the Ichneumonids were parasitic upon the larvæ of the Tremex. Accurate and positive observations on this point, however, seem not to have been made, or at least not to have been recorded, prior to our own, which will presently be quoted.

Harris (Ins. inj. to Veg., p. 538) says of the larva of *Tremex columba*:

> It is often destroyed by the maggots of two kinds of ichneumon-flies (*Pimpla atrata* and *lunator* of Fabricius). These flies may frequently be seen thrusting their slender borers, measuring 3 or 4 inches in length, into the trunks of trees inhabited by the grubs of the Tremex, and by other wood-eating insects; and, like the female Tremex, they sometimes become fastened to the trees and die without being able to draw their borers out again.

It will be noticed from the above-quoted passage that while Harris states positively that the larvæ of the parasites destroy the larvæ of the Tremex he says nothing about the place where the parasitic egg is laid and does not even hazard the supposition that the Tremex larva is pierced by the ovipositor of the parasite. Later authors, however, have loosely made this statement without evidence or authority. For instance, Packard (Guide, etc., p. 196) says:

The genus *Rhyssa* contains our largest species and frequents the holes of boring insects in the trunks of trees, inserting its remarkably long ovipositor in the body of the larvæ deeply imbedded in the trunk of the tree.

Following this statement, or possibly some previous one which we have not been able to place, the idea has been current that the wood-boring larva is pierced by the ovipositor of the parasite. As late as 1886 Professor Comstock, in the Standard Natural History, II, p. 514, says:

And the females (*Rhyssa*) are often found with their long ovipositors deeply sunken into the trunks of such trees (infested with Sirex) in the act of laying their eggs in the bodies of the wood-boring larvæ.

From the use of the generic name *Sirex*, Professor Comstock's statement would seem to be drawn from European sources, and this has led us to make some search of European records for observation upon allied species.

Westwood (Introd., etc., II, 150) says:

Some species, whose females are furnished with a very long ovipositor, are found on the trunks of trees, stumps of wood, etc., evidently searching for the lignivorous larvæ, in which they deposit their eggs.

Ratzeburg (Ichneumonen d. Forstins.) states that both Nördlinger and himself reared *Rhyssa persuasoria* from *Sirex spectrum*, and he also records *R. curvipes* as reared from *Xiphidria camelus*. He does not, however give any details of his observations, nor does he state that the parasite in ovipositing pierces the wood-boring grub.

In spite, however, of the lack of definite observations on this point, the idea was almost universally prevalent among entomologists up to recent years that the parasite pierced the grub with her ovipositor and deposited her egg in its body.

In the December, 1882, number of the *Canadian Entomologist*, Mr. Frederick Clarkson gave an account of observations upon this parasite which were, upon the whole, very similar to those which we had previously made. His article was called forth by a popular review of the habits of *atrata* and *lunator* contributed to the May number of the same journal by Mr. W. H. Harrington, in which the latter fell into the old error of stating that the female Thalessa deposits her eggs in the larvæ of the Uroceridæ and other wood-borers by means of her long ovipositor. Mr. Clarkson stated in brief that his experience had demonstrated that while it may be a fact that these insects deposit their eggs upon the

larvæ of Uroceridæ or other borers, they do not commonly do so. In every case that he observed the ovipositor entered through wood that had not been previously attacked, and in his opinion the egg is often, if not generally, laid regardless of contact with the larva. He concluded that if the Ichneumonid larvæ are carnivorous they must bore in search of food, as he thought it improbable that the adults performed the great labor of boring on the chance of meeting with a larva, but rather that they deposit eggs at every insertion.

In 1884 the question was brought up again by Mr. George Gade, of Fordham, N. Y. who had made practically the same observations as Mr. Clarkson, but who drew the strikingly erroneous conclusions that Thalessa is lignivorous and not parasitic. He is reported to have stated at the meeting of the Brooklyn Entomological Society, held September 27, 1884 (see Bulletin Brooklyn Entom. Soc., Vol. VII, Nov., 1884, page 103), that he had long doubted the parasitic habit of the species. He remarked:

I have, during the past season, watched many females ovipositing, and have cut off the ovipositor when ready to be withdrawn, and in no instance have I found a larva of any kind anywhere near the point reached by the borer and where the egg was deposited. The conclusion is, therefore, that the larva is a true wood-feeder, and not parasitic.

In the discussion which followed Messrs. George D. Hulst, and A. C. Weeks are stated to have announced that they had reached the same conclusion from independent observation.

At the December meeting of the Entomological Society of Washington we commented upon this report of Mr. Gade's observations, and later wrote to the editors of the Brooklyn Bulletin a letter which was published in the January (1885) number (page 123), giving the results of our own observation, and quoting the following letter, which we had previously written to Mr. J. A. Lintner, and which he published in an article of his own in the *Country Gentleman* for April 17, 1884 (vol. XLIX, page 331):

I have on several occasions had opportunity of closely studying not only the mode of oviposition, but of larval growth of *Rhyssa*. My sketches and notes are at home [written from Boscawen, N. H.], but the salient facts bearing on your question I can give from memory. In all instances where I have found the female depositing, it has been in trees infested with *Tremex columba*, and I have found her most numerous on badly affected or injured trees, or even on stumps or broken trunks already partly decayed. The instinct to reach the egg or larva of Tremex, so dwelt upon in popular accounts, is imaginary. She bores directly through the outer parts of the tree, and doubtless probes for a burrow; but her egg is consigned anywhere in the burrow; the young larva seeks its prey, and lives and develops without penetrating the body of its victim, but fastened to the exterior. This habit among parasites is much more common than is generally supposed. A great many *Rhyssa* larvæ doubtless perish without finding food, and a great many females die in probing for a burrow, especially when they burrow through wood that is sound and hard.

We also published in *Science*, November 28, 1884 (Vol. IV, No. 95, page 486), a note making the same criticism.

In the discussion which followed the reading of our letter at the November (1884) meeting of the Brooklyn society, as reported by Mr. John B. Smith, Mr. Gade announced himself as "positive that many of the logs frequented by the *Rhyssa* are not infested by Tremex or other wood-boring larva."

It follows from the accurate observations here brought together, and which do not depend upon inference, that Mr. Gade (as all those who support him) was entirely wrong in his conclusion that Thalessa is lignivorous; and though further observations were promised the ensuing year we have looked in vain in the reports of the meetings of the Brooklyn society for any subsequent statement or admission of error.

We have had in our collection since 1872 alcoholic specimens of *T. lunator*, as well as *Tremex columba* in all stages, taken from the trunk of a Box Elder (*Negundo aceroides*) on Mr. William Coleman's farm, near Merrimac, Mo. We took these on the 4th of July, 1872, and made notes as to the habits of the larva and pupa of both species. The tree was already partly dead, and, in fact, our experience in this as in subsequent observations, shows that in most cases the tree has been somewhat affected, so that the wood was not firm and healthy. This stump furnished an excellent opportunity for investigation, because it was so easily split, and we examined the burrows very carefully and found Thalessa in all stages at that time—larvæ, pupæ of both sexes, and imagines of both sexes within the tree, the larvæ being of various sizes and invariably external to the Tremex, *i. e.*, not within, but holding on to its victim and sucking the latter's life away, without in any case entering the body. At this same time females were also actively engaged in ovipositing, and by carefully tracing the ovipositor in several cases we came to the conclusion that she did not attempt to reach the Tremex larva but only to reach its burrow, and that the young parasitic larva after hatching must instinctively seek its victim. Thalessa, therefore, is not an internal parasite and in this it agrees with a great many other parasites both Hymenopterous and Coleopterous, *e. g.*, Ophion, Typhia, Euplectrus, Elachistus, Elasmus, Polysphincta, Acrodactyla, Rhipiphorus, etc., which are all external, as we know from our own experience and Mr. Howard's; while Tryphon, Sphinctus, and Paniscus are mentioned by Westwood as having the same habit. In fact, external parasitism is far more common among the larvæ of the Ichneumonidæ and the Chalcididæ than has hitherto been supposed, and may be said almost to be the rule with all parasites upon true Endophytes, and with secondary parasites. The truth of the whole matter is, that Thalessa, like all other insects, is liable to suffer from fallible instinct, and that while she doubtless has better means of distinguishing a tree infested by Tremex than we have, she nevertheless often makes mistakes, and the "unerring instinct" which book entomologists are so fond of dwelling

upon is often at fault. In our own experience we have never found her boring in uninfested trees, as others have done, and in cases where she fails to reach a Tremex larva and to fasten her egg upon or near it she must either reach a Tremex burrow or a Tremex larva must come in contact with such egg or the larva issuing therefrom to insure perpetuation. The Thalessa larva no doubt actively searches for its victim within the burrow, but, from the nature of its mouth-parts, is incapable of boring wood as Mr. Harrington and Mr. Clarkson suppose.

METHOD OF OVIPOSITION IN THALESSA.

The method of oviposition in a creature with such an enormously long ovipositor as Thalessa possesses must be of particular interest. We have had good opportunities of observing it. In preparing for the act the position is generally longitudinal or in a line with the axis of trunk or branch, the head either up or down. With the abdomen raised in the air the ovipositor is taken and managed with the hind legs, and the tip guided by the front tarsi. The two outer sheaths are used as props and do not enter the wood with the ovipositor proper. They are generally crossed — a position which gives additional strength and security to them. Now, by a movement from side to side, and by arching the abdomen and bearing upon the ovipositor she gradually forces this back through the tip of the abdomen into a membrane which issues

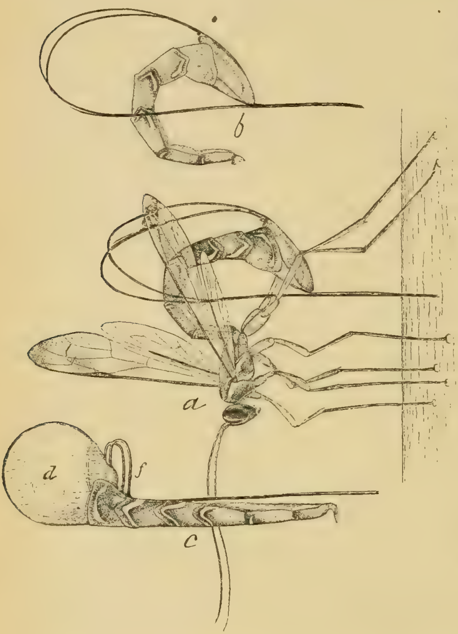


FIG. 36.—THALESSA LUNATOR. (*a*) Female in act of ovipositing; (*b*) abdomen showing outer sheaths in slightly different position; (*c*) abdomen stretched to its utmost, as when first inserting or finally withdrawing the ovipositor, and showing the coil of outer sheaths (*f*), the distended membrane (*d*), and the ovipositor coiled around inside it at periphery (original).

from between the sixth and seventh joints dorsally. There is a wonderful muscular power in the anal joints, and the ovipositor is forced back until it forms a perfect coil, so that when the abdomen is stretched in a straight line to its utmost (Fig. 36, *c*) the ovipositor within the membrane makes a circle almost as large as a quarter of a dollar, the anal joint having made a three-fourths turn within the membrane. In this manner the ovipositor under the venter has been sufficiently shortened to bring its tip against the bark. During this operation, however, the outer sheaths, which have not followed the ovipositor within the membrane, have been obliged to make a more or less irregular coil opposite to and in front of the membrane on the ventral side as at Fig. 36, *f*. Now commences the operation of boring, and with the wonderful muscular power in the anal joint and the elasticity of the membrane, the insertion of the ovipositor goes on quite steadily if the wood be in the least soft. As the borer enters, the sheaths make a larger and larger loop on one side of the body, or even a valve on each side, and at last, when the borer is well nigh inserted, they present the appearance represented in *a* and *b*. Our figures, made from sketches in the field at the time mentioned, will convey a very good idea of this interesting process. In withdrawing the ovipositor the reverse action takes place and the loops of the outer sheaths gradually become smaller and smaller; the ovipositor proper is again forced back into the tough bladder-like membrane between the sixth and seventh joints dorsally and we have a repetition of the appearance (*d*) as already described. The popular figures of the act of oviposition which we have so far seen are for the most part imaginary and erroneous. That of Rhyssa by Blanchard, for instance, is purely imaginary and shows the ovipositor inserted in a Sirex larva, while that by Wood is still poorer. The best we have seen, and evidently copied from some European work, we take from an old *American Agriculturist* (Fig. 37). The species is evidently *Rhyssa persuasoria*, which is common to Europe and North America, and which, having a relatively shorter ovipositor than Thalessa, may not require the elastic membrane. The larva and pupa of

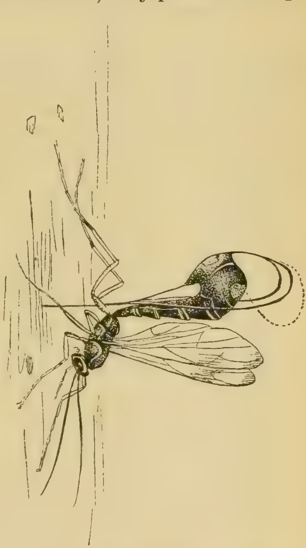


Fig. 37. *Rhyssa persuasoria* ovipositing. (After the *American Agriculturist*).

this species are figured and described by Snellen van Vollenhoven in *Tijdschrift voor Entomologie* (IV, 1860, pages 176, 177, plate 12). The ovipositor of the pupa, as is to be expected, is only about one-half as long as that of Thalessa.

Probably as good an account of the method of the boring as has been published, and one of the earliest accurate accounts, is that contributed by Mr. J. Quay to our *American Entomologist* for September, 1880 (Vol. III, page 219). We quote from this article as follows:

As these insects, by standing on "tip-toe" and elevating their abdomen to its fullest height, can clear but about 2 inches space, the problem presents itself as to how can the remaining 3 inches of ovipositor be disposed of in order to allow the drill end to enter the perforated stump.

I observed that after raising the abdomen as far as possible the drill was worked forward so as to slightly bend under, giving the insect a purchase on same. Then followed a bearing-down motion on the bent tube, curving the end of the abdomen forward and upward, and next forcing the ovipositor, near its attached end, to curve also and pass up through the abdomen and above into a cavity which there opened for its reception.

What a strange provision of nature!

The cavity was inclosed by a membranous sack, capable of great distension, and while the drill was being continually forced up through, it curled about within the sack, forming one complete bend of about three-fourths of an inch in diameter, and another partial one. When fully distended the sack was very thin, quite transparent, and seemingly upon the point of bursting apart. But the ovipositor was in this manner brought to the edge of the worm-hole, was slipped in, and thus made to ease away upon the distended sack, which, by collapsing, forced out again the drill by its mere force of contraction. The coil now soon disappeared, and the insect was fully prepared to commence operations upon the hapless *Tremex.*

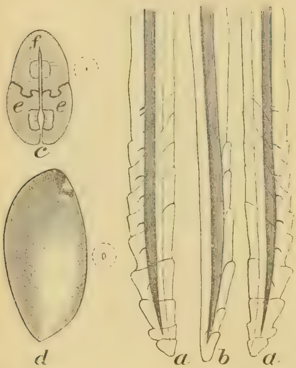


FIG. 38.—Ovipositor and egg of Thalessa; *a*, *b*, *a*, tips of component parts of ovipositor proper; *c*, cross-section of ovipositor; *d*, egg; *e*, *e*, ventral pieces of ovipositor proper; *f*, middle or dorsal piece of ovipositor, all greatly enlarged (original).

STRUCTURE OF THE OVIPOSITOR.

Our readers who have followed us so far will doubtless wonder how an egg can be passed down such a long ovipositor not wider than a horse-hair. A careful examination will show that this instrument is composed of three parts, which may, upon being softened, easily separate, but which in nature are securely locked together. Figure 38 illustrates the ends of these three parts *a*, *a*, *b* as they appear when on their flat sides, and it will be noticed that the tips are strongly notched diagonally, which structure facilitates the insertion or boring into the tree and renders extraction somewhat more difficult, especially where the wood is somewhat hard. Now the dorsal or central piece is solid at its

dorsal end and cleft on the inner side to about two-thirds or three-fourths its length. On either side of this cleft is a strong ridge or rail something after the fashion of a T-rail. Each of the ventral pieces, on the contrary, has a groove into which the rail-like ridges of the dorsal piece lock. The ventral pieces in the act of oviposition slide up and down these rails, which serve to keep the three pieces securely fastened together. Through the center of the dorsal piece runs a membranous duct, which is probably muscular, and is formed by a groove on either side of the cleft, while through the connected piece that the other or ventral pieces make when conjoined runs another similar duct. The margins of the membrane in either duct when seen by cross section look somewhat like a septum. Figure 38, *c*, shows a cross section of the three pieces when interlocked, taken about the middle of the ovipositor, the appearance varying somewhat in different parts of the instrument. The egg (Fig. 33, *d*) is 0.18^{mm} long and 0.13^{mm} in greatest width; it is ovoid in form, and compressed at the sides, and is evidently worked down by the muscular linings of these grooves. The pieces as a whole are, when interlocked, doubtless bulged out to admit of the passage of this egg. The greatest expansion must take place about the middle of the cleft by virtue of the fact that while the combined ovipositor is oval in transverse section the burrow or perforation is more cylindrical, thus permitting the bulging of the cleft at its middle and preventing too great separation of the open end formed by the ventral pieces.

We are much indebted to Mr. Gade for specimens of the egg, as also for preserved females showing the distended membrane. The dimensions of the egg which we have given are from eggs examined by dissection in the female abdomen, and correspond to the size of the ovipositor; but the eggs from Mr. Gade, and from which our figure was made, are larger and more elongate.

The manner in which the females, ėspecially after they have been enfeebled, become fast in the trunks which they bore has often been recorded as a matter of observation. On November 9, 1872, at Glencoe, Mo., we found the nearly mature female Thalessa in another Box Elder tree, already mature, but dormant, but evidently ready to issue early the following summer, because she had eaten right to the surface of the bark. The Tremex larvæ were at this time of all sizes, and a careful examination of this tree showed the vicissitudes to which these insects are subject, not only after, but before exit; for females of both genera were often found dead in the tree. The Thalessa matures within its burrow with the wings perfect, and as it depends very largely on the use of its matured jaws for escape, it frequently fails to escape when encountering gnarled and knotty wood.

The Tremex, both in the larva and pupa states, is quite subject to the attacks of a fungus, which so closely resembles the dying and decaying parts of the wood that the infected parts of the skin seemed filled with dead wood.

ARDOR OF THE MALES.

The ardor of the males of Thalessa has often been commented upon. Mr. W. H. Harrington, in the *Canadian Entomologist* for November, 1887 (Vol. XIX, p. 206), recounts, under the head "The Nuptials of Thalessa," a series of interesting observations made in June, 1887, and which showed that the males, having issued first, awaited the females, and were able to locate the spot at which a given female would emerge some time before she made her appearance. In one instance which he records, a particular spot was crowded with males for two days before the female emerged, and even then she was assisted by the removal of the bark by the observer. The males, in waiting, make every effort to reach the female, inserting the tips of their abdomen into crevices in the bark. On emerging the female is instantly seized, the legs of the male clasping the yet unused wings and abdomen, thus preventing her from flying.

DOES THE FEMALE OVIPOSIT IN EXPOSED LEPIDOPTEROUS LARVÆ?

In a communication to the *Country Gentleman* of July 12, 1883, page 561, Prof. J. A. Lintner raised the question as to whether this insect was really constructed for preying as a parasite upon internal borers or whether it did not prey upon exposed larvæ. He wrote as follows:

> The question is therefore raised, Are the commonly accepted habits of the "long-stings" correctly given? Has any one actually seen them in the act of probing the burrows of a *Tremex?* Such an operation has never come under my observation, while probably all field entomologists have repeatedly found them fastened by their ovipositor firmly inserted in apparently solid wood. I recall an instance observed by me several years ago, when what I think must have been *Rhyssa lunator*, was earnestly engaged in placing its eggs in a colony of a species of *Datana*, feeding upon a branch of hickory, in the following singular manner: Its ovipositor was bent beneath it, extending between its legs, with its tip projecting in front of its head, enabling it with perfect ease to select one caterpillar after another for the reception of its eggs. Why would not this be a much better method of using the long ovipositor than the one generally ascribed to it? There would certainly be no hap-hazard work in such oviposition, or any waste of material. In the instance above recorded each thrust told, as was seen in the well-known alarm-jerk of these larvæ, at once communicated from the victim to the entire group. Unfortunately the importance of the observation was not known to me at the time, and no further attention was given to it.

Quite recently, desiring to learn whether Professor Lintner had obtained any further evidence to justify so singular a statement, we addressed him and he informed us that he had no further experience other than that given in his forthcoming report, of which he kindly sent us advance proofs, and in which he quotes a similar observation narrated by Mr. J. S. Woodward, secretary of the New York State Agricultural Society, after repeating his own experience as we have quoted it. The trouble is that in both Mr. Lintner's and Mr. Woodward's observations memory is the sole guide and there has been no positive identification of the species, and, though we have a high regard for the observational powers of both these gentlemen, it seems to us that both must be in error, because a study of the structure of the ovipositor in Thalessa shows clearly

that it is not adapted for stinging soft-bodied larvæ. The very curious structural peculiarities of the abdomen, which we have just described, and which are essential to permit the tip of the ovipositor to be projected against the trunk of the tree are also inconsistent with the motions described by Professor Lintner. So, also, the labored force necessary to bring the ovipositor in position, and in the general act of oviposition in Thalessa, does not agree with what is there described. While the relative length of ovipositor to body varies somewhat, the former generally extends about five inches from the tip of the latter, and if brought under the body would extend over three inches beyond the head. Moreover there is no sharp lance at tip, nor means of curving this last so as to bring it on the back of a caterpillar with the Ichneumon in the position described by Lintner.

The ovipositor of Thalessa is, in short, an elaborate boring and sawing instrument. The simplest explanation of both Lintner's and Woodward's observations would be that, if the insect was Thalessa, she was by chance boring a branch or trunk infested with Tremex at a place where Datana larvæ were massing, as they are known to congregate for moulting purposes in masses upon the trunk. But, as will be seen, Professor Lintner's statement is too explicit as to the alarm-jerk of the stung Datana larvæ to justify this first explanation of the riddle, and the attitude assumed by Thalessa would not correspond to his description; so that upon careful consideration we are satisfied that the true explanation is that some other large Ichneumonid was observed by both and by both mistaken for Thalessa. Some of the large Ophionids of the genera Thyreodon, Exochilum, or Heteropelma might be quite easily mistaken therefor, especially at some little distance.

Both Exochilum and Heteropelma are parasitic upon Bombycid larvæ, which feed externally like Datana, and in our breeding experience we have found the commonest parasite of *Datana ministra* and *Datana integerrima* to be a large undescribed Heteropelma that might easily be confounded with *Thalessa lunator*, unless one is quite careful in observation. It is true that the ovipositor in these genera can not be extended to any great length, probably not more than half an inch; but the abdomen in oviposition is undoubtedly curved under the body in such way that the caterpillars are stung in front of the parasite very much as described by Mr. Lintner. The abdomen is long enough to allow this, and it is the customary position with Ophionids when ovipositing. Another, black, species (*H. flavicornis*) resembles, in a similar way, *Thalessa atrata*.

The particular species of Heteropelma which we have bred from Datana larva is undescribed, and at Mr. Cresson's request we add a description of it in this connection :

Heteropelma datanæ sp. nov.

Female.—Average length 25^{mm}; expanse 35^{mm}. General color ferruginous-brown, the abdomen verging to bronzy-black. *Head:* Antennæ uniform yellowish-brown, a

little darker than head and thorax, the scape yellowish below; face below antennæ, and a narrow band around eyes (sometimes obsolete above) gamboge yellow; eyes black or dark brown. *Thorax* darker above than below; mesoscutum with three broad indistinct darker longitudinal bands, which vary considerably in intensity, rather sparsely punctate, slightly shining, with a very faint median longitudinal sulcus; mesoscutellum usually rather lighter in color than scutum, more densely punctate, opaque; metanotum varying considerably in intensity of color, very rugose, the irregular carinæ which produce the rugosity much darker than the intervening spaces, a very shallow median longitudinal groove; legs, especially tibiæ and tarsi, lighter in color than thorax; front trochanters sometimes quite yellow; first joint of hind tarsi fully five times as long as second joint; wings uniformly dark fuliginous, with a bronze reflection; tegulæ concolorous with rest of mesoscutum. *Abdomen* with petiole, concolorous with thorax; joint 2 with a black stripe above, reddish-brow below; joints 3 to 7 dusky, nearly black, with a bronzy or purplish sheen; lighter on ventral line; outer sheaths of ovipositor lanceolate, black except at immediate base and strongly pilose.

Eight ♀ specimens from pupæ of *Datana integerrima.*

Differs at a glance from the only other North American species of the genus, viz: *H. flavicornis* Brullé and *H. longipes* Provancher.

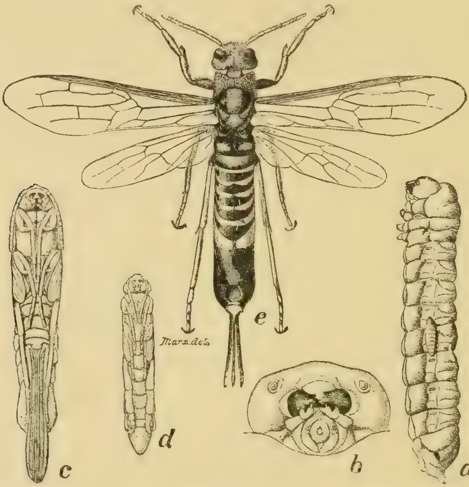
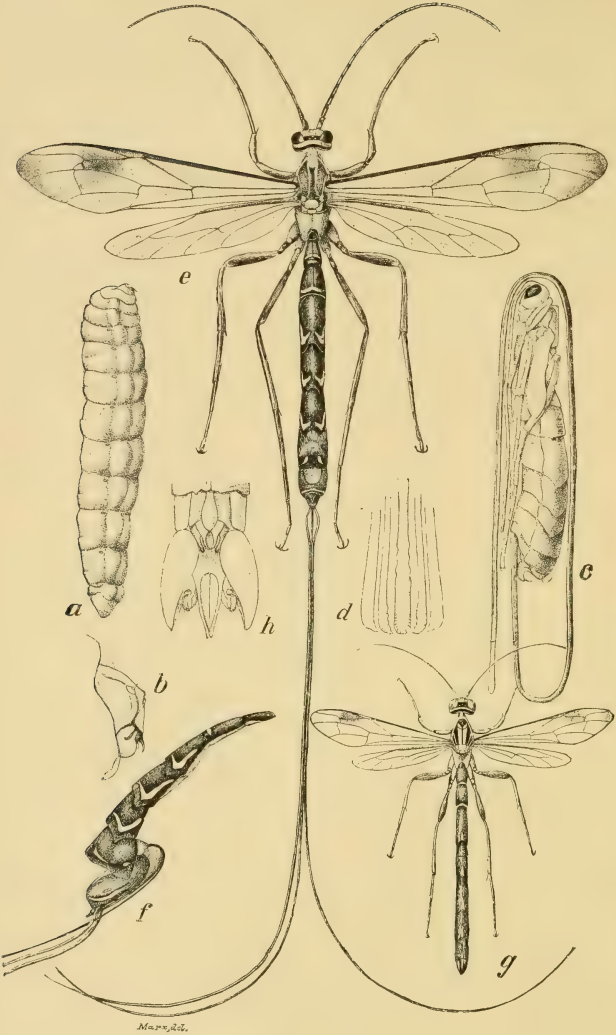


FIG. 39.—TREMEX COLUMBA. *a*, larva, showing Thalessa larva attached to its side; *b*, head of larva, front view, enlarged; *c*, female pupa, ventral view; *d*, male pupa, ventral view; *e*, adult female—all slightly enlarged (original).

In reference to the transformations of Thalessa our figures will sufficiently illustrate them so that there is not much need of a further remark. The larva (Plate I, *a*), as will be seen, has the ordinary Ichneumonid form, tapering at both ends, and has the typical parasitic jaws (*b*) quite incapable of gnawing through wood. The spiracles are normally arranged. The most interesting feature of the adolescent stages is the pupa in which the long ovipositor extends at first in a direct line from the point of in-



THALESSA LUNATOR.

sertion and then bends in a loop and is brought back over the dorsum and around the head and then back again on the ventral side, hugging the legs, its tip reaching far beyond the tip of the abdomen. In this it differs from the European *Rhyssa persuasoria*, in which the ovipositor of the pupa, according to Snellen's figures, previously mentioned, reaches only some two-thirds the length of the body behind the back.

It remains only to state in reference to the habits and transformations of Tremex (see Fig. 39) that, from the facts already mentioned, it would seem that the imagines mature, as a rule, somewhat later than Thalessa, and that the larvæ are found of various sizes on the approach of winter. We have also found, on one occasion, at Emporia, Kans., on December 16, 1874, in *Celtis occidentalis*, a Tremex imago somewhat torpid and eaten half-way out of the trunk. There are no positive records in this country to show the length of duration of the larva state in either of these genera, but we should expect the Thalessa larva to develop most rapidly when once it finds its food, but to possess also great power of enduring without food in early life. There is doubtless much irregularity in development in both genera, especially after the pupa state is assumed, while the period of oviposition, as we know, may cover several of the summer months.

The larva (Fig. 39, *a*) has the normal form of the horn-tails, being blunter at both ends than the Thalessa, with an anal thorn, short thoracic legs and strong gnawing jaws (Fig. 39, *b*). Our figure (*a*) shows a young Thalessa larva attached about the middle, just as it has remained since 1872 in our alcoholic specimens. The ovipositor in the female pupa, as shown in the figure (*c*) is not bent.

We have the authority of Kollar that the larva of *Sirex gigas* attains full growth in seven weeks after the laying of the egg, and that in the pupa state it may remain in the tree for several years. Normally both Thalessa and Tremex probably go through their transformations within a year. *Tremex columba* is at times abundant enough to materially injure trees, and Mr. Jonathan Periam, the present editor of the *Prairie Farmer*, sent us an account (November 28, 1873) of a hickory tree which he believed was killed by it. Our figures will convey a very good idea of the adolescent states of both. They were drawn by Dr. Marx, with our assistance, from our Missouri material, and also from a pupa kindly loaned for the purpose by Dr. H. A. Hagen, our own examples of the pupa being too mature to permit of a good figure being made.

EXPLANATION TO PLATE I.

Thalessa lunator: a, larva, side view; *b*, head of larva from side; *c*, pupa, side view; *d*, tip of ovipositor of pupa, ventral view greatly enlarged to show five parts (including sheaths) of which it consists; *e*, adult female; *f*, abdomen of adult female from side, showing gap between joints 6 and 7, from which the membrane distends when ovipositor is in action; *g*, adult male; *h*, anal extremity of abdomen of male enlarged. (Original.)

NOTES ON LACHNOSTERNA FUSCA, Auct.

By John B. Smith.

Among the injurious insects most commonly referred to in economic papers and reports the above species stands in the first rank. It is known universally as the parent of the "white-grub," and a very general impression prevails that there is but one grub of that kind. As a matter of fact, there are quite a number of species which are almost equally as common, locally or seasonally, as the *L. fusca*, and the injury done by them has, according to the usual rule, been saddled on the universal scapegoat, which in this genus has been *fusca*. Until very lately entomologists have been entirely at sea as to the specific limitations of our species. It was an understood matter that they were very variable and afforded no safe characters for differentiation. In November, 1887, in Trans. Amer. Entom. Soc., XIV, 209–296, was begun a paper by Dr G. H. Horn, issued early in the present year, which at last brought order out of confusion, and enabled us to arrange our material with some degree of satisfaction.

Among the species recognized, *fusca* is the one credited by Dr. Horn with the greatest amount of variation, and several races are indicated, which are yet said to present no distinctive characters. At the same time Dr. Horn does not seem to be quite sure that there is after all but one species, even though the characters separating them are not obvious. The collections of the National Museum are very rich in specimens and species in this genus, and large collections made this spring, and obtained from various parts of the country, have enabled me to somewhat supplement Dr. Horn's work on the genus. Attention once drawn to a very strongly marked character of the genital structure of both sexes, investigation was continued along this line with the most gratifying results, since the characters afforded are constant, strongly marked, and readily verified. At the present time, only the diversities observed in the species known as *fusca* will be described, further notes made on the large majority of our other species being reserved for publication when more complete.

Studied in the light of the genital structure, *fusca* resolves itself into four distinct species, each almost equally common at special localities, but not at the same.

The characters in which all these forms agree are as follows: Body not pubescent above, shining; antennæ 10-jointed, the club of male always longer than that of the female; clypeus not densely punctured, the margin moderately reflexed, feebly emarginate; lateral margin of thorax not serrate, nor distinctly angulate; the posterior tibiæ are truncate at apex, without a trace of sinuation at the base of the fixed spur of the male; this spur is of moderate size; claws strongly toothed at

middle; the size is large, facies robust; punctuation not coarse; the males with a more or less curved ventral ridge on the penultimate abdominal segment, and without a cupuliform depression on the last segment.

With these positive characters, there is an infinite variation in size, shade of color, form, punctuation, and vestiture. Several species heretofore created on these characters have been properly united by Dr. Horn, for all of them are evanescent, and not to be relied upon for the distinction of species; a positive character, however, is found in the form of the ventral ridge of the penultimate abdominal segment; based on this character, the species into which I would divide *fusca* are recognizable as follows:

Ridge straight; posteriorly not overhanging, but nearly as gradual as the anterior declivity .... *grandis*
Ridge longer, slightly curved, the ends overhanging posteriorly; centrally the ridge is declivous but not overhanging behind .... *fusca*
Ridge shorter, decidedly arcuate, overhanging posteriorly for its full length, the ends at some distance from the posterior margin of the penultimate segment .... *dubia*
Ridge still shorter, still more arcuate, still more overhanging, the ends at the extreme margin of the penultimate segment, and somewhat overhanging the terminal segment .... *arcuata*

By this table the males may be distinguished without much trouble. The females are not so easily separated, yet may in most cases be associated with the males.

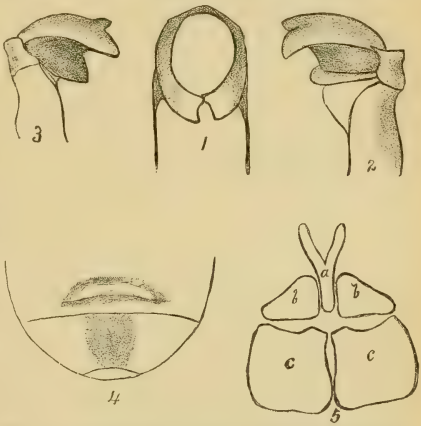


FIG. 40. LACHNOSTERNA GRANDIS: 1, clasper of male from front and above; 2, clasper of male (right) from side; 3, clasper of male (left) from side; 4, ventral characters of male; 5, genital structure of female; 5*a*, pubic process; 5*b*, superior plates; 5*c*, inferior plates—enlarged (original).

L. GRANDIS sp. nov.

This species is, as a whole, rather larger than either of the others, and rather more robust. The sides of the thorax are very perceptibly subangulate before the middle, giving the species a distinctive appearance easily recognized in both sexes.

In the female, the last segment is emarginate, and the middle of the abdomen, especially toward base, is distinctly and somewhat aciculate punctate. The male character has been sufficiently given in the table. The last segment is granulate-punctate.

Within my experience this is the rarest of the *fusca* forms, though widely distributed. I have seen it from Texas, North Carolina, Georgia, District of Columbia, Illinois, Colorado, Maryland, New York, Wisconsin, Nova Scotia, Lake Superior Region. Mr. Schwarz thinks it more common in the latter region than the other species. In the District of Columbia it is rare, only a few specimens being known in collections.

I shall not attempt a verbal description of the sexual characters of the male, since the figures will give a better idea than could be otherwise given. In the female this species is peculiar by the slenderly furcate pubic process, and the triangular upper plates, which are completely separated by the pubic process. The lower plates are quadrate or nearly so.

L. FUSCA Fröhl.

This is the form which Dr. Horn in his paper suggests as the form probably seen by Frölich, and upon which he based his species. It offers no points of superficial difference from the following species, with which it agrees in form, color, size, and general habitus. The ventral character in the male must be examined to recognize that sex, and no difficulty will be found in this. The female of this species, on the contrary, differs from all the other forms in that the last segment is not emarginate. This character is at once obvious on examination, and the species is thus readily recognizable in both sexes.

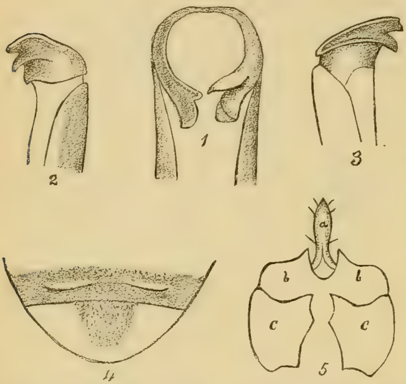


Fig. 41.—LACHNOSTERNA FUSCA. 1, clasper of male from front and above; 2, clasper of male (right) from side; 3, clasper of male (left) from side; 4, ventral characters of male; 5, genital structure of female; 5*a*, pubic process; 5*b*, superior plates; 5*c*, inferior plates—enlarged (original).

A comparison of the figures of the male characters with those of *grandis* will at once show how they differ, while still after the same general type. The female shows a greater difference, and differs also from all the others of this group by having the pubic process a simple cylindrical rod somewhat dilated medially and terminating in an obtuse point. The upper plates are coalescent on the median line, and are somewhat irregular.

This species we have from Texas, New York, New Jersey, Ohio, Illinois, District of Columbia, Iowa.

It is the common form around New York City, was the only form found in a large lot of material from Cleveland, Ohio, and was repre-

sented in great proportion in a lot of specimens from the vicinity of Chicago, Ill. In the District of Columbia it is rare, but a single specimen having been found the present season.

L. DUBIA sp. nov.

Completely resembles the preceding in all outward appearance and habitus. The ventral characters of the male must be resorted to for the identification of that sex. As appears from the figure the ridge is decidedly more curved than in the preceding species, and is in every respect more distinctly marked. The primary characters will show on comparison with the previous figures a considerable change in type, which indicates apparently a greater divergence between this and *fusca* than there is between *fusca* and *grandis*. In the female the last ventral segment is emarginate, and it is therefore easily distinguished from that of *fusca*. In the corneous characters of the genitalia the differences noted in the male are emphasized. The pubic process here becomes broad, stout, somewhat contracted medially, and divided superiorly into two branches which are broad, somewhat flattened, and obliquely truncate. The superior plates are narrow, linear.

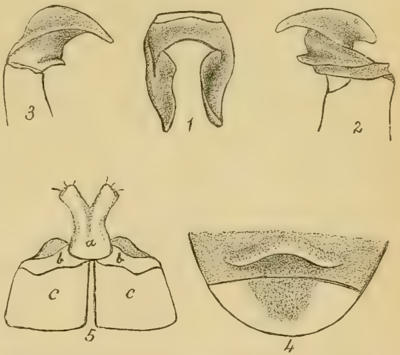


FIG. 42.—LACHNOSTERNA DUBIA. 1, clasper of male from front and above; 2, clasper of male (right) from side; 3, clasper of male (left) from side; 4, ventral characters of male; 5, genital structure of female; 5*a*, pubic process; 5*b*, superior plates; 5*c*, inferior plates—enlarged (original).

Altogether, it is a distinct species, showing quite a distinct difference in type in the genital structure of both sexes.

This species we have from Massachusetts, New York, New Jersey, Maine, North Carolina, District of Columbia, Illinois, Ohio, Texas, Colorado, Tennessee, Nevada, Montana, California, Wisconsin. Of all the others this extends farthest west, and the race *cephalica* Lec. belongs to this species. It is fairly numerous at New York; forms a fair proportion of the specimens received from Chicago, Ill., but is rare at Washington, no specimens having been collected this season, and only a few specimens in the local collections indicating its occurrence.

L. ARCUATA sp. nov.

This species is as a whole rather smaller than either of the others, although it has probably as great an average length. From *dubia*

it does not differ at all in the female in superficial characters, every effort having failed to discover any feature whereby specimens of this sex might be distinguished from each other. As the genital structure is so distinct this is rather surprising, and the distinguishing feature will no doubt be still discovered.

The primary characters of the female genitalia are of the same type shown in *dubia*, but the distinction is yet obvious. The pubic process, while divided at tip much as in the preceding species, is only about half as long, and does not divide the upper plates as in the preceding species. It resembles the upper part of the *dubia* structure set upon the superior plates; these latter are large and nearly quadrate, in marked contrast with the narrow, linear structures of *dubia*. The inferior plates differ as markedly, as can be readily seen by a comparison of the figures.

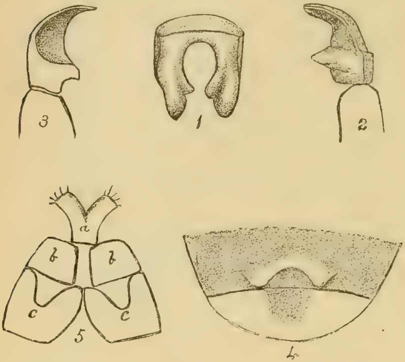


FIG. 43.—LACHNOSTERNA ARCUATA. 1, clasper of male from front and above; 2, clasper of male (right) from side; 3, clasper of male (left) from side; 4, ventral characters of male; 5, genital structure of female; 5*a*, pubic process; 5*b*, superior plates; 5*c*, inferior plates—enlarged (original).

The males also offer no habital or other differences from *dubia*, except in the ventral characters, but these are obvious and easily recognized. The ridge in this species is very much curved, very much overhanging, the ends reaching the apical margin of the segment, while the arch, combined with the depression of the last segment, forms a perfect oval. In this species the space included by the arch of the ridge is smooth; in *dubia* it is punctured.

This species seems rather more southern than the preceding. It is practically the only form taken at Washington, many thousands being taken while only one specimen of the other forms was discovered. Other localities are New York, New Jersey, Central Missouri, Iowa, Georgia. The specimens from New York and New Jersey are from my collection, and form the small minority of the specimens taken. The specimens from Central Missouri are from Professor Riley's collection, and the figures in the Missouri Reports, so extensively copied, probably represent this species.

Finally, these forms represent a series of species, evidently derived from the same stock, and which have differentiated in physiological rather than superficial or habital characters. They have become dif-

ferentiated in both sexes, but have retained those superficial appearances which we may suppose were of value to the ancestor of all these forms.

The study of these characters in all our available species will be continued, and we may hope that a permanent result, so far as the present limitation of species is concerned, can be thus arrived at.

I have taken the course of proposing new names for three of the forms here described, although several names exist in the synonomy which might possibly be available. I have done this because, after discussing the matter with Dr. Horn, he assures me that it would be almost impossible to discover which of the forms, as separated by me, the authors had before them. An examination of the types will have to be made, and as the characters relied upon were in almost every instance color, punctuation, size, or some other equally variable character, it is more than probable that each of the authors have mixed up two or more species under the same name. At any rate, even if the names proposed by me should eventually be referred as synonyms, they will at least have served their purpose of making specific identification certain.

A SANDWICH ISLAND SUGAR-CANE BORER.

(*Sphenophorus obscurus* Boisd.)

In August last we received from Mr. E. J. Wickson, of Berkeley, Cal., a piece of sugar-cane, brought from the Sandwich Islands, infested by borers, which were reported to do considerable damage. The specimens were sent to Professor Wickson by Prof. LeRoy D. Brown, president of the State University of Nevada, who collected them in June while visiting the Sandwich Islands. Professor Brown's attention was called to the subject by his Majesty, King Kalakaua, who requested him to bring the specimens to this country for study. The cane received at the Department proved to be infested by the larvæ of a large Snout-beetle of the genus Sphenophorus, several species of which are known to bore into the stalks and roots of corn in this country. Our Annual Report for 1881–2, page 138 *ff*, contains an account of the habits and transformations of the species which more particularly affect corn in the United States, and which are known as Corn Bill-bugs.

The only previous notice of Sugar-cane Borers in the Hawaiian Islands with which we are familiar is from the *Hawaiian Planter's Monthly* for July, 1883, but this refers to the Lepidopterous borer *Chilo saccharalis*, a species which is widely distributed wherever Sugar-cane is grown. Another species of Sphenophorus affects Sugar-cane in the West Indies and South America and was described by the Rev. Lansdown Guilding in his prize essay on "Insects Affecting Sugar-cane" (Trans. Soc. of Arts, Vol. XLVI, 1828) as *S. sacchari*, while the well-known *Rhyncho-*

phorus palmarum is also mentioned as injuring the cane in the same locality.

We succeeded later in rearing the adult beetle, but failing, with the literature at our command, to recognize it among the vast number of described species, we sent a specimen to Dr. David Sharp, of England, who kindly gave us the following references quoted from the "Memoirs on the Coleoptera of the Hawaiian Islands," by T. Blackburn and D. Sharp,* a work which we could not consult:

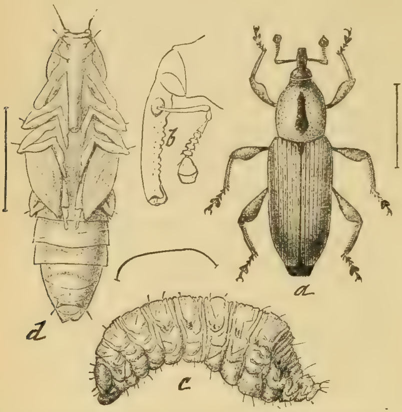


FIG. 44.—SPHENOPHORUS OBSCURUS. *a*, adult, enlarged; *b*, head of adult, from side, still more enlarged; *c*, full-grown larva, from side; *d*, pupa, ventral view, both enlarged (original).

Genus CXXVI. *Sphenophorus* Mun. Cat., VIII, p. 2646. 360. *Calandra obscura*, Boisd. Voy. Astr. II, p. 448. Fairm. Rev. Zool., 1849, p. 474.

Ins. Oahu. Introduced. Tahiti, New Ireland. In the stems of banana, on the mountains. This insect is apparently omitted in the Munich Catalogue of Coleoptera.

Dr. Sharp further wrote that his original identification of the species was made from Boisduval's deficient description and from Fairmaire's paper, and from a specimen so named by Jekel, in the British Museum collection. After receiving our specimen (which was a male, while the Jekel specimen was a female) Dr. Sharp found both sexes of the same species among some specimens recently sent him from Tahiti by Mr. J. J. Walker, who found them under the bark of a species of *Musa* (Banana).

The species belongs to Schoenherr's and Lacordaire's genus Sphenophorus, and should be included in the group having the third tarsal joint large and pubescent beneath. The disintegration of this large genus, already indicated by Schoenherr and more strongly advocated by Lacordaire has been accomplished in more recent times by Dr. Horn, Dr. Le Conte, Mr. Pascoe, and especially by Mr. Chevrolat. The work of the latter author (published in the Ann. de la Soc. Ent. de France, 1882 and 1885, partly after Chevrolat's death, the whole being evidently incomplete and unfinished) is of such unsatisfactory and unsystematic character that the generic determination of a single species is next to impossible without having access to the types.

Although we can not place our species in any of the numerous genera erected by Chevrolat at the expense of the old genus Sphenophorus, it

*Published in Trans. Royal Dublin Soc. (2) III, 1885, pp. 119–300.

seems best to leave the generic determination to a future monograph of this group, and we prefer to leave the species in that genus under which it was originally described. In order to facilitate the recognition of this species, which has been described in publications not readily accessible, we append a description of the imago by Mr. Schwarz which he has drawn up at our request to accompany these notes.

Generic characters.—Rostrum slender, moderately curved beneath, in the male with impressed median line and two longitudinal rows of rounded tubercles. Antennæ sub-basal, funicle 6-jointed, first joint longer than wide, second longer than the first, the following sub-transverse gradually becoming larger; club hardly securiform and moderately compressed, spongy portion nearly two-thirds as long as smooth portion and obliquely truncate each side. Eyes transverse, flat, not contiguous beneath. Prosternum between coxæ not linear and about half as wide as the diameter of the coxal cavity. Scutellum elongate, flat. Mesothoracic epimera not ascending, obtuse at outer anterior angle. Legs rather stout, femora thickening apically and strongly sinuate at tip; tibiæ not curved, longitudinally carinate, on inner side fringed with very short setæ; third tarsal joint large, entirely spongy pubescent beneath, second and third joints spongy pubescent at tip. Abdomen with 5 segments. Closely allied to *Cactophagus*, with which it agrees in the form of the antennal club and the third tarsal joint but differs in the shorter beak, which is bi-seriately tubercled beneath in the ♂; second joint of funicle longer than first; scutellum elongate, legs stouter with clavate femora, tibiæ longitudinally carinate.

Specific characters of ♂.—Length from tip of thorax to tip of elytra 13.5 millimeters. General color rufo-piceous (perhaps immature). Beak as long as thorax, but little compressed, gently dilated at basal third; above rather finely and densely punctate, more coarsely at the sides; a small frontal puncture; beneath the impressed median line becomes deeper and wider toward the base, the tubercles forming the row each side of the median line smooth and rounded and more numerous at tip than posteriorly. (Fig. 43, *b*). Head sparingly and finely unctate. Antennal scape opaque and tomentose, first and second joints of funicle smooth except at tips, the remaining joints opaque, nearly moniliform; smooth part of club with a row of coarse setigerous punctures near the base. *Thorax* distinctly longer than wide, basal margin rounded, sides straight from base to beyond the middle, thence arcuately narrowing; a well-marked, short tubular constriction at tip, front margin straight; surface shining, even, except a slight ante-basal median depression; rather finely punctulate on disc, with an ill-defined longitudinal smooth space at middle, punctures larger toward the sides and especially in the ante-basal depression, basal margin densely punctured; color orange-yellow with rather broad black median stripe not reaching apex and base; flanks more opaque with two large black patches. Scutellum elongate, acute at tip, surface even. Elytra sub-opaque at base, as wide as base of thorax, nearly 1½ times as long as thorax and twice as long as wide; humeri obliquely truncate, sides feebly converging posteriorly, separately rounded at tip; sub-opaque; color (immature specimen?) dirty piceous-yellow with indistinct black marking (especially a large longitudinal stripe toward the sides); punctate-striate, striæ moderately deep, the punctures remote and not strong; suture at base with a row of fine punctures, rest of suture and the other interstices each with a series of small tubercles which are sometimes rounded but more often (especially posteriorly) confluent into little longitudinal carinæ of varying length. Pygidium sub-triangular, longer than wide, sub-truncate at tip, longitudinally convex, sub-opaque, densely punctulate at base, very coarsely and more sparsely at apex. Underside reddish piceous, somewhat shining; pro- and mesosternum coarsely punctured, the former without impression (except the apical constriction), the latter with moderately deep notch at middle, opaque and sparsely punctured at sides; first abdominal segment as long as

the last and both densely and coarsely punctured; segments 2–4 rather finely punctured at middle, more coarsely at the side, segment 2 a little shorter than the first, 3 and 4 equal, each shorter than the second. *Femora*, orange-yellow trochanters and tip of femora black; tibiæ dirty brownish yellow, simple (not bi-spinose) at tip, tarsi piceous.

The structure of the head, mouth-parts and the transverse folds of the segments of the larva (Fig. 43, *c*) agrees with that of *Sphenophorus robustus*, described and figured by us in our Annual Report for 1881–'82, (p. 141–142, pl. VIII, Fig. 2, *a*) but is distinguished at once by the rather sudden enlargement of abdominal segments 4, 5, and 6, the fifth being especially large and bulging. In this respect it resembles the larva of *Sphenophorus liratus* as described and figured by Ch. Coquerel (Ann. Soc. Ent. France, 1849, p. 455–456, Plate VIII, Fig. III, 2), but in the latter species the enlargement of the abdominal segments is said to be gradual. The thoracic and anterior abdominal spiracles are as in *S. robustus;* the sixth and seventh pairs are, however, more dorsally placed and the eighth pair is entirely dorsal, somewhat obliquely placed and as large as the prothoracic spiracles. The last segment is broadly truncate at middle of apex, the truncature being accompanied each side by a shorter oblique truncature. The four angles thus formed are marked each by two long setæ, one placed above the other.

The pupa (Fig. 43, *d*), while resembling in general shape that of *S. robustus*, is distinguished by the stronger armature of the head. The two setigerous frontal tubercles are very prominent and surrounded anteriorly by a crescent-shaped ridge in front of which is a small setigerous tubercle. The tubercles near the base of the beak are also more prominent. Near the hind angles of the thorax are each side two rather large, blunt tubercles, and another obliquely placed pair of smaller tubercles on each side of the disc toward the anterior angles; two small tubercles are also at the middle of the anterior margin. The armature of the pygidium (seventh dorsal abdominal segment) consists of a single row of rather large setigerous tubercles, and the last ventral segment is truncated at tip, terminating each side into a bi setose cone-like process. The prothoracic spiracles are very large and conspicuous.

Judging from the specimens of sugar-cane received from Mr. Wickson the damage caused by the beetle must be very great since the stalks were completely riddled with the galleries of the larvæ, several of the latter being in a piece of cane about 8 inches long. The galleries (Fig. 45) are wide when compared with the diameter of the larva, and not long, mostly running longitudinally, but some also across the cane. They are filled with macerated fiber which the larva apparently pushes behind itself. When ready to pupate the larva somewhat enlarges the channel and forms a coarse cocoon of fiber in which the transformation takes place. The outside of the infested cane (Fig. 44) shows several small round holes which probably represent the place where the egg has been inserted by the parent beetle, and several large, oblong openings which are probably the exit holes of the emerging beetle.

As we received no other notes on the natural history of the species we can say nothing as to time and mode of oviposition, the duration of the larval state, hibernation, etc. The only other information is that contained in the quotation from Blackburn and Sharp's Memoir on the Hawaiian Coleoptera, viz: That the species attacks also banana stems, and further that it has been introduced (no doubt with sugar-cane or banana plants) from other islands in the Pacific Ocean.

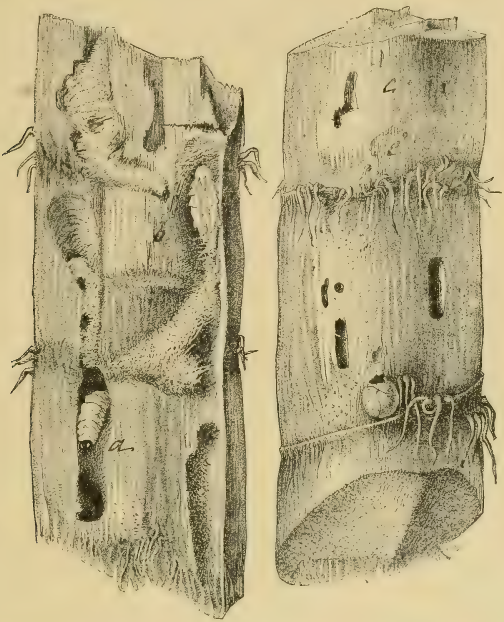


FIG. 45.—Sections of sugar cane showing work of *Sphenophorus obscurus*: *a*, larva; *b*, pupa, in situ, *c*, probably points of oviposition, somewhat reduced (original).

In the absence of any more definite information it is difficult to suggest any preventives or remedies for this pest. Since the larva apparently works in the lower part of the canes and probably also in the roots, many larvæ will no doubt remain in those parts of the plants after the rest of the cane has been cut and carried off to the sugar-houses. The remaining stubble should be carefully examined and all infested stumps destroyed. The same should be done with all diseased or dying banana plants.

Since neither sugar-cane nor bananas are cultivated in California there is little danger that this Sphenophorus will become acclimated in that State from the Sandwich Islands.

EXTRACTS FROM CORRESPONDENCE.

The "Red Bug" injuring Oranges again.

I send you by this mail a small box containing what to us is a new insect, which attacks and is most destructive to the fruit of the Orange tree. It has but recently appeared, and, as far as I know, is confined to a few trees in a large grove joining our place in the east. The fruit has nearly all fallen from the first tree attacked, and in this tree there are thousands of the insects, which are now mostly engaged in reproducing the species. The oranges are covered with them, and they follow the fruit to the ground, being as thick in that as what is on the tree. They are not injurious to the tree, as far as I can observe, though they swarm upon the trunk and branches. Their proboscis is of sufficient length to penetrate through the thick skin of the orange, so that they appear to feed upon the juice only. I urged the owner of the grove to spray the trees with hot water, and finally have his promise to do so upon my furnishing the outfit and he the water. I expect I can get him at it to-morrow.—[A. L. Duncan, Dunedin, Hillsborough County, Fla., November 8, 1888.

REPLY.— * * * The insect which you send and which is damaging your neighbor's oranges, is the common "Red Bug" or "Cotton Stainer" (*Dysdercus suturellus*). The normal food of this insect is cotton, and its original home is probably in the Bahama Islands or the West Indies. It has long been known, however, as a Florida insect, and many years ago seriously damaged the cotton crop both in this State and upon the sea islands of Georgia. Its first appearance as an orange destroyer, so far as we know, was in 1879, and you will find some short account of it in the Annual Report of this Department for that year. So far as our experience goes this insect only damages oranges near which cotton is grown, and we should be interested to learn whether this is the case with your neighbor's oranges. The worst damage has always been during a season in which the bugs have multiplied profusely upon cotton, and after picking have migrated to the neighboring orange trees. It has been noticed that the bugs accumulate in great numbers, especially during cold nights, upon heaps of cotton seed outside the gins, and this has suggested that as a remedy small heaps of cotton seed might be placed at intervals through the groves, and in the early morning the bugs which have collected upon them might be destroyed by the use of hot water. Your advice to your neighbor is good, but you will probably find that spraying the insects with a dilute kerosene emulsion made according to the Hubbard formula will be more efficacious than the hot water alone. * * * —[November 14, 1888.]

Further Injury in the Treasury by Roaches.

Allow me to introduce Mr. E. Hergesheimer, Chief of Drawing Division, who will tell you about our trouble with pests of the same nature as infested your records. Please give him the benefit of your experience.—[B. A. Colonna, Assistant Chief U. S. Coast and Geodetic Survey Office, to E. B. Youmans, Chief Clerk Treasury, September 18, 1888.

Respectfully submitted to the Honorable Assistant Secretary, with recommendation that this matter be referred to the Department of Agriculture for such advice as that Department may be able to give, looking toward relief from the pests mentioned.—[E. B. Youmans, Chief Clerk, to Hon. Hugh S. Thompson, Assistant Secretary of the Treasury, September 18, 1888.

Respectfully referred to the Honorable Commissioner of Agriculture with request that he will have this matter investigated by the Entomologist of his Department, and such action suggested by him as will lead up to the object desired.—[Hugh S.

Thompson, Assistant Secretary of the Treasury, to the Honorable Commissioner of Agriculture, September 18, 1888.

REPLY.—The letter from Mr. B. A. Colonna, introducing Mr. Hergesheimer, accompanied by drawing of map injured by insects, and referred by you to this Department, has been received and referred to the Entomologist. He replies as follows:

"The drawing injured is that of a map made on tracing cloth, the lines of red, blue, and green pigment having been eaten as well as patches in places not touched by ink. This injury has been done by the Croton Bug, *Ectobia germanica.* These insects are well known to attack anything that has any paste in its make-up. As a remedy for them use the Pyrethrum powder or California Buhach. It should be sprinkled wherever the roaches run, and on them if possible. The best time to do this is in the evening, so that the application will be made just before they begin to run. * * If this remedy is used thoroughly and persistently it will surely afford relief. * * This and the large species, *Periplaneta americana*, were investigated and reported upon in the Treasury by this Division in May last. * *"—[F. C. Nesbit, Acting Commissioner of Agriculture, to Hon. Hugh S. Thompson, Assistant Secretary of the Treasury, September 19, 1888.]

Beetles supposed to have been passed by a Patient.

The five insects sent herewith seem to me to be three different kinds of beetles. History: They were sent to me by a reputable physician of southern Illinois. He says they were found in the stools of a patient—a lad working on a farm; that this is the third time that they have been found; that they followed the administration of a saline cathartic. Please name for me, give their habits, etc., and I shall be under many new obligations.—[J. M. Shaffer, M. D., Physician to Board of Health, Keokuk, Iowa, August 31, 1888.

REPLY.—Yours of the 31st ultimo, with specimens of beetles supposed to have been passed by a farm boy in southern Illinois, has at last come to hand. * * * The beetles are of three different species, viz, *Onthophagus hecate*, *O. pennsylvanicus*, and *Aphodius granarius.* These beetles are all found in manure and dung of different animals, and I consider that, without question, they must have entered the stools of the boy *after* the latter had been passed. It is very unlikely that he passed the insects themselves.—[September 18, 1888.]

A Tineid on Carpets in Texas.

I have sent you by this mail a small box containing some kind of a bug; I do not know much about them. In the first place, I live in a rock house (my reason for telling that is because I never saw them in a wooden one). They are to be found along the edges of carpets, on the furniture generally, as though eating the veneer; their favorite haunt is in and around the fire-place; they also go up the chimney in large numbers. What are they?—[David Hampton, Burnet, Tex., October 6, 1888.

REPLY.— * * * These insects are very interesting and are new to our collection here. They are cloth-feeding Tineids, but the species we can not determine until we have reared the moth. Can you not send another supply of specimens? You do not mention whether they seem to do any damage to your carpets, and I wish that you would inform us on that point. Please send a large lot of specimens before you begin to destroy them, and you can probably kill them easiest by a free use of California Buhach.—[October 22, 1888.]

Leaf-stripping Ants in Arizona.

Can you give me any information that will help me to destroy the leaf-eating ants? They are very thick on my ranch, and I don't know what to do to get rid of them. It seems impossible to kill them in the ground. They are a medium-sized red

ant, and they throw up little mounds and seem to do nothing only to eat leav°s. They will strip a tree of every leaf in one night. They have done so much damage to my nursery that I have got to go to work and destroy them if possible. If there is any way that will fix them please let me know. * * * —[D. Turner, Paradise Nursery, Phœnix, Maricopa County, Ariz., October 27, 1888.

REPLY.— * * * While it is impossible to say with absolute certainty just what species you complain of, it is in all probability the Leaf-eating Ant of Texas (*Œcodoma ferens*). Inasmuch as you state that you are able to find easily the mounds which they make, your best plan will be to attack them with bisulphide of carbon, which you can use in the following manner: Having secured a pound or so of this volatile liquid, thoroughly wet a large blanket with water, pouring perhaps a tablespoonful of the bisulphide into each of several of the larger holes in the mound; then throw the wet blanket over the mound, allowing it to remain for from ten to fifteen minutes. Then remove the blanket and by means of a lighted kerosene rag at the end of a pole explode the bisulphide vapor at the mouth of the holes into which you have poured it. The rationale of this operation is as follows: The bisulphide vapor being heavier than the air sinks down through the burrows of the ants and the explosion forces it in every direction, upwards and sidewards, through the burrows and it is instant death to every ant with which it comes in contact. Repeat this operation with every mound which you find, and although the trouble will be considerable you will succeed in eradicating the pest. Be careful, however, in handling the bisulphide, as it is very volatile and inflammable. Should you try this remedy, please inform us of the result.—[November 3, 1888.]

The Hessian Fly in England.

* * * I found the puparia (Hessian fly) in almost every field around Strand, which is, so far as I know, the most westerly point from which it has been reported. I also caught three males on a window of the house where we were staying.

One of the curiosities I met with near Bham was a farmer who was "perfectly satisfied with the crop of wheat;" who would not have anything taken out of his field—no! not the "'Essen fly"; and who wanted to lock me up for trespassing in his stubble field. Whose fault is it that these *British* farmers are utterly ignorant as to the appearance of an infested crop? What use is a stupid report and list of places where the fly has occurred? From puparia collected August 5, 1887, I bred the last Cecid. September 21, 1888. Truly this is a queer bug.—[Fred. Enock, London, England, October 13, 1888.

Stinging Caterpillar of Lagoa opercularis.

I send you by mail to-day a worm or caterpillar found upon a rose-bush. On Sunday last a patient came to me with evidences of poisoning inflicted by a similar caterpillar; the face was affected, redness, swelling, and great and intense pain. Same readily passed off, but was very intense. Please let me know something of the "beast," name, etc.—[H. B. Horlbeck, Department of Health, Charleston, S. C., October 23, 1888.

REPLY.—The caterpillar in question is one of the so-called stinging caterpillars, and this particular species is *Lagoa opercularis.* Underneath the long silky hairs which you notice are concealed shorter stiff hairs, exceedingly sharp at the points, which produce a nettling when they penetrate the flesh. This caterpillar is quite common from New Jersey southward, and feeds upon a great many different plants. There are generally two annual generations and the insect passes the winter in its cocoon. The moth is yellow in color, tinged with brown.—[October 26, 1888.]

Rebuttal of Wier's Statements regarding the Plum Curculio.

Following the line of investigation, as a rebuttal of D. B. Wier's statements regarding the behavior of the Plum Curculio I am able to furnish the following report, based upon close observation of a few of our practical men during the present season:

(1) There has been no preference discovered as to the varieties of plums attacked.

(2) A large portion of the eggs deposited in the Wild Goose Plum failed to hatch, but enough did to destroy about two-thirds of the crop.

(3) Native varieties (wild) of plums are no more exempt than those in the cultivated grounds.

Spraying with London purple.—This work was begun as soon as the blossoms appeared and followed up to the time the fruit was fully formed. In the same orchard several trees were omitted in the spraying treatment, and as large a per cent. of sound fruit was gathered from them as from those sprayed. The solution was sufficiently strong to burn some of the leaves, as it was my privilege to observe.

The Bag or Basket Worm has been quite numerous at Parsons, Kans., this year upon large Red Cedar trees. Spraying with London purple has been thoroughly applied and failed. Can you advise any other means besides hand-picking?—[G. C. Brackett, Kansas State Horticultural Society, Lawrence, Kans., September 25, 1888.

GENERAL NOTES.

GRAIN INSECTS IN AUSTRALIA.

Just at present the colony of South Australia is considerably exercised over the Hessian Fly and other grain insects. Last July we received a communication from Mr. F. S. Crawford asking for our opinion concerning the importation of the five principal grain pests from Europe and from this country into Australia in grass hay. We replied that from the life habits of the insects we imagined that there would be little or no danger respecting the Wheat Midge (*Diplosis tritici*), the Ribbon-footed Corn-fly (*Chlorops tæniopus*), or the Wheat Saw-fly (*Cephus pygmæus*). The Hessian Fly (*Cecidomyia destructor*) and the Joint-worms (*Isosoma* spp.), however, might be so imported, as both hibernate in the straw. We also informed him that in our opinion a restriction compelling the burning of straw or hay packing would be far preferable to any legislation for preventing the importation of goods so packed, as in the former way no disturbance to commerce would result and the scheme could be so much more easily carried out and practically enforced. If the packing should be simply grass hay, the danger would be much slighter than if wheat, rye, or barley straw were used.

The matter was brought before the meeting of the Bureau of Agriculture at Adelaide, on September 17. It seems from the report that none of the insects in question have as yet made their appearance in the colony, although the recent well-founded scares in England and in New Zealand have suggested to the Australians the necessity for the utmost precautions. Against the measures suggested as preventives of the fly's introduction it was contended that too much importance was attached to the alleged risk, and that it would be a most serious

matter to commercial men if the proposed packing restrictions were put into force. The question of the action to be taken by the neighboring colony, Victoria, was also brought up, and the necessity for united action was put forth; for if one colony prohibited certain packing and the other did not, the latter would gain a commercial advantage; hence, a conference between delegates was suggested. The following motion was finally carried:

> That the bureau are of the opinion that to check the introduction of the Hessian Fly and kindred dangerous insects it would be necessary to prohibit the importation of all goods packed in straw of cereals of any kind. This would result in a great loss and inconvenience to our South Australian importers, and the bureau would recommend that an inspector under the vines, fruits, and vegetable protection act confer with the officers holding similar appointments in the adjacent colonies, with a view of their Governments arriving at some common act.

Our own suggestion had at that time not been considered, and Mr. Crawford, in writing to us under date of September 30, raises the objection that although at first it might seem the best way out of the difficulty, he is afraid that in practice it would be found a greater evil than limiting the packing to certain vegetable products, because all earthenware, china, glass, etc., would have to be unpacked and repacked in bond, which, of course, would be strongly objected to by importers; or if the straw were burned on the importers own premises it would be necessary to have a customs officer or inspector present to see it done.

It strikes us after considering this objection that the best and safest way out of the difficulty is to combine the two suggestions and restrict the packing material to certain safe substances *under penalty* of having straw packing burned at the custom-house and at the risk in unpacking and repacking of the importer. It seems to us, moreover, that if the Hessian Fly does not make its appearance in Australia during or immediately after the present year of the Melbourne exposition, when so much merchandise from this country and from England has been carried over, we may reasonably expect exemption for years to come.

Many kinds of packing material are in common use in this country and the restriction as to the kind of packing would probably not work to the serious disadvantage of American exporters.

FURTHER CONCERNING THE LOCUST WAR IN ALGERIA.

Mr. J. Künckel d'Herculais, President Entomological Society of France, has addressed a report to the Governor-general of Algeria upon the subject of the Locusts and their invasion of Algeria. The particular conclusions at which Mr. d'Herculais arrives are as follows:

(1) The necessity of organizing, after the example of the Americans and the Russians, a permanent scientific service, charged with the study of the Migratory Locusts; study of the habits of different species; researches upon the centers of multiplication; the providing of maps (tracé de cartes) of prevision of invasions and of maps of the progress of invasions; researches upon the natural causes of destruction; researches upon the practical methods of destruction.

(2) The necessity of organizing a service trained in the handling of different apparatus and in implements and methods of destruction.

(3) The necessity of providing resources by the establishment of a special tax after the example of the English in the island of Cyprus.

These conclusions were recommended by the Agronomic section of the French Association for the Advancement of Science March 30, and the whole association in general assembly April 3, sanctioned the propositions of the section. As a result the President of the French Entomological Society has been charged by the minister of public instruction, at the request of the Governor-general of Algeria, with the organization of a scientific commission for the study of the locusts which ravage the French Algerian colony.

AN IMPORTANT CONTRIBUTION TO LEPIDOPTEROLOGY.*

This paper gives a review in monographic form of a very interesting group of species. All the species heretofore described are noted here, while a considerable number of species are for the first time characterized. Lord Walsingham says "Anophorinæ," and in his introductory remarks gives the characters of the group so termed. The number of genera is increased from three to thirteen, and the characters are structural. The genera are therefore easy of determination, if somewhat numerous. A leading character is the apical vein, which is said to be either forked or not forked. The number of American species is increased from eight to seventeen. One noteworthy feature of the paper is that the male genital organs are described for almost every species, putting them on a sound basis in every respect. Figures of the most of these structures are also given. In the terminology of the parts the words "uncus" and "clasper" are employed. We shall have some remarks on the nomenclature of these parts in some future number.

The arrangement of the American species, according to the result of Lord Walsingham's studies, is as follows:

Neolophus Wlsm., gen. nov.
  furcatus Wlsm., sp. nov., Arizona.
Eulepiste Wlsm.
  cressoni Wlsm., Texas.
  maculifer Wlsm., sp. nov., Arizona.
Hyloclopus Wlsm., gen. nov.
  griseus Wlsm., sp. nov., Arizona.
Acrolophus Poey.
  simulatus Wlsm., Texas.
  plumifrontellus Clem., North Carolina, Massachusetts, New York.
    bombycina Zell.
  mortipennellus Grt., Central Alabama.
  cervinus Wlsm., sp. nov., Texas.
  texanellus Chamb., Texas.
  arizonellus Wlsm., sp. nov., Arizona.
Anaphora Clem.
  morrisoni Wlsm., sp. nov., Florida.
  propinqua Wlsm., sp. nov., Florida.
  popeanella Clem., Missouri, Texas, North Carolina.
    agrotipennella Grt.
    scardina Zell.
  tenuis Wlsm., sp. nov., North Carolina.
  macrogaster Wlsm., sp. nov., Arizona.
Felderia Wlsm., gen. nov.
  filicornis Wlsm., sp. nov., Arizona.
Ortholophus Wlsm., gen. nov.
  variabilis Wlsm., Arizona.
Pseudanaphora Wlsm., gen. nov.
  arcanella Clem., Minn.

*A revision of the genera *Acrolophus* Poey, and *Anaphora* Clem. By the Right Honorable Lord Walsingham, M. A., F. Z. S., etc. Trans. Ent. Soc., Lond., 1887, pp. 137–173, pl. VII and VIII.

THE POISONOUS NATURE OF THE MECONIUM OF LEPIDOPTERA.

Mr. Th. Goosens, at the meeting of April 11 of the French Entomological Society, read a note upon the Meconium of Butterflies. It seems that he had in a bottle some chrysalids of *Vanessa prorsa.* There were also in the bottle some caterpillars of *Fidonia atomaria*, but these were in a tube, and the tube had a cork stopper. One of the Vanessas issued, spread its wings, and, ready to take its flight, ejected the meconium amassed in its chrysalis state. This matter fell upon the stopper and immediately killed the twenty caterpillars. The experiment was repeated by placing a little of this liquid in a bottle with another lot of caterpillars, which also perished. Larvæ, however, placed in contact with the dry meconium lived as usual. His conclusion was that it is probably the evaporation of the substance, which is composed in a large part of uric acid, which has the property of killing caterpillars, and that its poisonous action is often the unsuspected cause of the death of larvæ in breeding-cages.

THE PEACH-TWIG MOTH AND ITS PARASITE.

Popular Gardening for July, 1888, reports a so-called "new enemy to the Peach" in Delaware and Maryland, which is said to be a worm from one-quarter to three-eighths of an inch long, and about as thick as a pin. It feeds on the leaf, buds, and ends of the young shoots, which of course kills the tips of the twigs. Some orchards in Kent and Sussex Counties, Delaware, are said to look as if a fire had passed over the ends of the twigs and scorched the leaves. The origin and habits of the pest are said to be not yet known, while the area over which it appears is said to be limited.

It seems from reading this item that this is by no means a new enemy, but that it is the old and well-known *Anarsia lineatella* Clemens. This insect was mentioned in the Annual Report of this Department for 1872, by Mr. Glover, as having done a great deal of damage in the vicinity of the Maryland Agricultural College in May of that year. Almost all of the twigs of the trees were observed to be killed at the end. The moth was bred and identified and the insect studied in all stages. Apple trees were observed to be damaged in the same way, supposably by the same insect.

Our notes show that adult insects issue during May and June and the next brood infests the fruit of peach. The larvæ are found during the latter part of July and August and mature during September. The larva leaves the fruit before transforming and suspends itself to the outside of the fruit. The first full account published is by Professor Comstock, in the Annual Report of this Department for 1879, page 255. According to the Annual Report of the Entomological Society of Ontario for 1872, Mr. William Saunders has found the same larva boring in the roots of Strawberry in Ontario. Mr. Lintner, in

his first report as State Entomologist of New York, published in 1882, has a rather extensive article upon the same subject, and records peach twigs as damaged at five localities in the State of New York, so that the insect is far from being a new pest. The best remedy will be to clip and burn the infested twigs as soon as they are noticed in May. In Professor Comstock's article, before-mentioned, it is said that a Chalcid parasite was bred from this insect. The specimens of this parasite we have had in the Department collection for all these years under the MS. name of *Copidosoma variegatum*, and in Bulletin 5 of this Division, in which we described a number of species of this genus, this one was overlooked. We take this occasion to submit a formal description:

Copidosoma variegatum sp. nov. Howard.

Female.—Length, 0.93^{mm}; expanse, 2.2^{mm}; greatest width of fore-wing, 0.49^{mm}. Club of antennae flattened, rounded at tip, as long as all of the other funicle joints together; pedicel twice as long as first funicle joint. Punctation of head and thorax as in *C. gelechiæ*. Marginal vein of fore-wings entirely wanting. General color black, with brilliant metallic green luster; scape of antenna black, white at tip; pedicel black; first four funicle joints white; joints 5 and 6 of funicle brown; club brown; all coxæ metallic; all femora and tibiæ dark brown, white at tips; all tarsi white.

Described from six ♀ specimens, all bred from a single larva of *Anarsia lineatella*, which was inflated as are the larvæ which harbor other species of Copidosoma.—L. O. H.

TWO ABNORMAL HONEY-BEES.

At the meeting of the Entomological Society of France May 23, Mr. H. Lucas exhibited two specimens of the common Honey-bee, which were collected near Bordeaux and which were remarkable from the fact that in the one the left eye is small, while the right eye, on the contrary, is strongly developed and even extends beyond the median part of the front. With the other specimen the exact contrary occurs, and it is the left eye which is more developed than that of the right side, which is plainly smaller. On account of this extremely remarkable anomaly it could be said that these bees, from this character, belong upon the one side to the male sex and upon the other to the neuter.

RE-APPEARANCE OF LACHNUS PLATANICOLA.

This year we have noticed an abundance of the large Sycamore Tree-louse, *Lachnus platanicola* Riley (fam. *Aphididæ*), on the Sycamores, or Western Plane-trees, in Washington. A number of trees along the walk bordering the west side of the Capitol Grounds were found infested with them in September, the insects being principally on the smaller, lower branches, clinging in large patches to the bark, while the pavement below was stained with the exudations which had dropped from their bodies in such quantities as to form miniature pools on the sidewalk. At this time the individuals composing the patches represented

all the early stages, varying from very small ones up to nearly full-grown specimens, none however being winged.

In October several trees on La Fayette square, in front of the Cosmos Club, were also noticed to be infested, the brick walk beneath being similarly stained by them.

This species was described by Professor Riley in 1883, in the *American Naturalist* for February of that year, with a notice of its excessive abundance in 1882, not only in Washington, but in many other parts of the United States.—T. T.

TWO ALIEN PESTS OF THE GREENHOUSE.

Of the food habits of the adult Locust Borer very little appears to have been observed, although they are known to frequent the blossoms of *Solidago* during September.

On two occasions these beetles have been brought to me by the florist of Purdue University, with the complaint that they were found in the greenhouse eating the leaves of roses, and in no case were they observed to molest other plants.

On October 11 complaints came from the same quarter regarding a bug which clustered on the buds of Chrysanthemums, causing the latter to discolor. Inspection revealed the depredator to be the Tarnished Plant-bug, in the pupal and adult stages, the latter predominating. These were not observed to attack any other plant, and were destroyed by fumigating with tobacco smoke.—F. M. W.

[We doubt the accuracy of the observation as to *Cyllene robiniæ* eating rose leaves.—Eds.]

THE FOOD-HABITS OF NORTH AMERICAN CALANDRIDAE.

We take this opportunity to publish (suggested by our article on the Sandwich Island Sugar-cane Borer) a short review of the food-habits of the North American Calandridæ, to which family the genus *Sphenophorus* belongs, derived both from published records and our own notes. As will be seen, there is considerable diversity even among the comparatively few genera of our fauna.

The genus *Calandra* infests stored grains (wheat, corn, rice, etc.).

The genera *Dryotribus*, *Gononotus*, *Macrancylus*, *Mesites* (?), *Elassoptes* are strictly maritime and live in larva and imago states in old boards, roots, etc., washed up on the beach.

The genera *Dryophthorus*, *Himatium*, *Cossomus*, *Allomimus*, *Caulophilus*, *Phlœophagus*, *Wollastonia*, *Amaurorhinus*, *Rhyncolus*, *Stenoscelis* live under bark of dead and decaying wood, or bore into decaying wood of deciduous or coniferous trees.

Rhodobænus 13-*punctatus* infests the stems of various plants, *Xanthium strumarium*, *Ambrosia*, and Thistle.

Cactophagus validus has been found exclusively under decaying *Opuntia* leaves, the larva no doubt living within the leaves or roots of the same plant.

The genera *Yuccaborus* and *Scyphophorus* infest plants of the genus *Yucca*.

The genus *Rhynchophorus* infests palmetto trees.

The genus *Sphenophorus* infests the roots or lower part of the stems of various wild or cultivated Graminaceous plants. One or perhaps several species are strictly maritime.

A small number of genera remain of which the food-habits are still unknown.

THE NATURAL FOOD-PLANT OF GRAPTODERA FOLIACEA Lec.

Miss Murtfeldt's interesting observations on this species (p. 74) show that it feeds greedily on the foliage of the apple tree, and on the authority of Professor Riley it is stated also to feed on hawthorn. Possibly it is not confined to any group of plants, but it may be worth mentioning that I found specimens of a beetle, referred by Professor Riley to this species, in considerable abundance on *Cucurbita perennis* Gray, at Cottonwood Springs, Pueblo County, Colo., last August. They appear to be entirely confined to the Cucurbita, and one might have supposed that it was their proper food-plant under ordinary circumstances. I have not yet heard of their doing damage to the cultivated melons, squashes, etc.—T. D. A. Cockerell, West Cliff, Colo., October 14, 1888.

A REMARKABLE INSECT ENEMY TO LIVE STOCK.

The numerous published accounts of the loss of life not only of stock, but of human beings, from the sting of the Whip-tailed Scorpion (*Thelyphonus giganteus*), and the consequent popular names of "Nigger-killer" and "Mule-killer" are sufficiently absurd to those who know its harmless nature; but there is some little excuse for such tales on account of the close resemblance of the animal to the true scorpions, which are, in reality, more or less poisonous. No excuse, however, can be offered for the statement which was recently sent us from Texas by a correspondent who forwarded a specimen of *Mantis carolina* with the information that a gentleman told him he had lost a valuable horse by one of these insects. We would, therefore, suggest as a new popular name for this Mantis, "The Texas Horse-killer!"

FURTHER ON THE IMPORTATION OF LESTOPHONUS.

Just as we are going to press we learn from Mr. D. W. Coquillett, our agent at Los Angeles, Cal., that he has received Mr. Koebele's shipment concerning which we quote Mr. Koebele in the Special Notes of this number. A tent had been placed around an orange tree in anticipation of the arrival of the parasites. The boxes were taken inside the

tent and opened. Up to the time of writing sixty specimens of Lestophonus had issued under the tent. In the case of living plants were found living Chrysopa adults and two species of Coccinellid larvæ, also many eggs and cocoons of Chrysopa. The adults of Lestophonus will doubtless continue to issue, and we have every reason to hope that they will oviposit in the Iceryas upon the tree under the tent. Two Coccinellid larvæ were found crawling outside of the case from which they had emerged through cracks in the putty. When transferred to the orange tree they attacked the first Icerya they met.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

December 6, 1886.—An amendment of the constitution, relating to the dues of the various classes of members was discussed and adopted. Mr. S. Lowell Elliott was elected a corresponding member of the Society.

Dr. Marx made a communication on the structure of *Hypochilus*, a form showing intermediate characters between the *Tetrapneumones* and *Dipneumones*. He showed in what features it related to each of these groups, and also that in its nest making habits it combined the characters of both *Territelariæ* and *Tubitellariæ*. He also made some remarks on the characters of the *Dysderidæ*, *Filistatidæ*, and *Ciniflonidæ*, the latter a family which he deems unnecessary, although recognized by Emerton.

Prof. Riley, commenting on this paper, thinks the present bases of division, although apparently disturbed by such forms as that discovered by Dr. Marx, may yet be systematically useful. He also urged upon Dr. Marx the importance of a study of our *Theraphosidæ*. Dr. Marx replied that in this family nothing could be done at present, since the classification now in use was not based upon a study of our fauna, and the characters used weie totally inapplicable.

Mr. Howard remarked that he had recently read in the Tr. New Zealand Inst. for 1869, an account of the *katipo*, or poisonous spider of New Zealand, which appears to be a species of *Latrodectes*. This is found on the sea-beach in the sedges, and was not feared by the natives at a distance of half a stone's throw from the water.

Mr. Ashmead said that he had seen a peach orchard defoliated by a spider. He states positively that he has seen the spiders bite pieces out of the leaves, but does not say that he saw them afterward chew the bitten pieces.

Prof. Riley made a communication upon the larvæ of *Leptinus* and *Leptinillus*, showing their relationship to that of *Platypsyllus*. Larvæ and imagos of the former had been found around Washington, in nests of Graphops, and larvæ and imagos of the latter had been found upon the beaver in California. No pupæ of either had been found.

Prof. Riley also made a communication on the habits of *Thalessa*, which is proved an external parasite on *Tremex*. He also gave an account of the egg and of the structure of the ovipositor. He thinks the statement of Messrs. Lintner and Woodward that *Thalessa* also oviposits in the larva of *Datana ministra* was based upon an error of observation, *Heteropelma datanæ*, n. sp., having probably been mistaken for *Thalessa*.

Mr. Schwarz exhibited a *Telamona* having a globular sac projecting equally above and below the surfaces of the carapace. He supposes this sac to be formed by a parasite in a manner similar to that in which *Gonatopus* forms a sac on certain *Rhynchota*. The Society then adjourned.

J. B. Smith,
Recording Secretary.

PERSONNEL OF THOSE ENGAGED IN GOVERNMENT ENTOMOLOGICAL WORK.

The following list embraces those now engaged in Government entomological work, and who will assist in the management of the periodical, those at Washington editorially, and the others as contributors. The force of the Division of Entomology is more or less inconstant, as it consists of both permanent and temporary employés:

DIVISION OF ENTOMOLOGY, U. S. DEPARTMENT OF AGRICULTURE.

Entomologist: C. V. Riley.

Office Staff: L. O. Howard, First Assistant; E. A. Schwarz, Th. Pergande, Tyler Townsend, W. B. Alwood, Assistants; Philip Walker, Assistant in silk-culture and in charge of reeling experiments.

Field Agents: Samuel Henshaw, Boston, Mass.; F. M. Webster, Lafayette, Ind.; Herbert Osborn, Ames, Iowa; N. W. McLain, Hinsdale, Ill.; Mary E. Murtfeldt, Kirkwood, Mo.; Lawrence Bruner, Lincoln, Nebr.; D. W. Coquillett, Los Angeles, Cal.; Albert Koebele, Alameda, Cal.

DEPARTMENT OF INSECTS, U. S. NATIONAL MUSEUM.

Honorary Curator: C. V. Riley.

Assistant Curator: John B. Smith.

☞For bibliographical purposes it may be necessary to state that, where expedient, the names or initials of members of the force will be attached to their communications. Where initials alone are appended, the full name can be ascertained by referring to the list above given.

Editorial or unsigned articles or notes should be credited to "Insect Life," or, where it is desired to give personal credit, to "Riley and Howard." While most of the correspondence of the Division is carried on by myself, yet much of it is also attended to by my first assistant, Mr. Howard, who acts as Entomologist in charge during my absence, and otherwise so materially assists in editorial and office work that only those articles signed by either should be considered individual.—C. V. R.

U. S. DEPARTMENT OF AGRICULTURE.

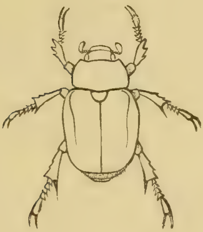
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. JANUARY, 1889.

Vol. I. No. 7.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS, WITH THE SANCTION OF THE COMMISSIONER OF AGRICULTURE.



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1889.

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2

SPECIAL NOTES.

We have just sent our Indiana agent, Mr. F. M. Webster, to Australia to assist in the collection of the parasites of the Fluted Scale (*Icerya purchasi*), and to write up a report on the agricultural aspects of the Melbourne Exposition. Mr. Webster sailed December 15, and will return to this country in March.

As will be noticed from the third page of the cover of this number, Mr. W. B. Alwood has resigned his position in the Division and Mr. C. L. Marlatt has been appointed. Mr. Alwood has accepted the position of Vice-Director of the Virginia Agricultural Experiment Station at Blacksburg, Va. Mr. Marlatt comes to us from the Kansas State Agricultural College at Manhattan, where he has held the position of Assistant in Entomology.

A number of workers in economic entomology will soon be coming to the front. Under the Hatch experiment-station act, something over twenty of the State experiment stations have been able to appoint an entomologist among the officers. Some of the appointees have been well trained in economic entomology, while others are young men fresh from college with only a general knowledge of the subject. So large a number of men situated in different parts of the country, devoting their time wholly or in part to work which should be original and experimental, can not fail to produce important results. It has long seemed to us that much could be gained through an association of those actually working in this direction, and since this enlargement of the number of workers the desirability of such an association seems to us greater than ever before. Other specialists, as the chemists, the ornithologists, the icthyologists, have their national organizations and their annual meetings to discuss methods of work and fields for investigation.

It seems to us that there should be a national organization of those entomologists engaged in the practical application of the science, meet-

ing, say, once a year, to discuss new discoveries, and particularly to exchange experiences as to methods of work, whether in field or laboratory. Such a coming together of those engaged in kindred work and the consequent interchange of experience and intercommunion could not fail to be productive of good both socially and scientifically. Economic entomology has heretofore greatly suffered by the writings and pretensions of those who have no sort of appreciation of its real value and importance, but who, writing at second hand, upon subjects of which they have no personal knowledge whatever, are just as apt to disseminate error as truth. We should like to get an expression from those of the readers of INSECT LIFE interested in the work as to the desirability and feasibility of such a national organization, and particularly as to how many could attend a meeting once a year in some one of our large cities.

Kerosene Emulsion—An Error corrected.—We have unfortunately been misquoted of late relative to a statement made in the Introduction to our 1886 report. We there stated that where milk is not accessible a satisfactory kerosene emulsion can be made with the white of egg and a little sugar, and gave the most desirable proportions. We notice, however, that *Orchard and Garden* for February, 1888, and other journals on previous dates have published the entirely unwarranted statement that "Professor Riley has had the best results in fighting scale insects with a kerosene emulsion prepared after the following formula," quoting the white of egg and sugar recipe. Our position is thus entirely misrepresented.

It will be news to most entomologists to learn that the Wm. H. Edwards collection of Rhopalocera has been purchased by the Rev. W. J. Holland, of Pittsburg, Pa. The collection of Dr. Holland, as thus enriched, is probably one of the largest as well as typically the most perfect collection of the Rhopalocera of temperate North America. In addition to the collection of Wm. H. Edwards it contains the entire collection of Mr. Theodore L. Mead, and a large number of specimens derived from Morrison, Wright, Behrens, Ricksecker, and other collectors, in all fully 8,000 specimens, representing the nearly 700 species credited to our fauna. As an illustration of the richness of this collection, it may be mentioned that *Lycæna pseudargiolus* is represented by 256 specimens, ranging in their distribution according to their localities from St. Michaels, Alaska, to southern Florida, and from Quebec to Arizona, with a large series of bred specimens arranged according to pedigree from one brood to another, showing the lineage of the seasonal or dimorphic forms.

The Rhopalocera of other lands are well represented, notably by specimens from tropical America, Africa, and Asia, and by fine suites of the

Japanese species, collected in 1887 by Dr. Holland during his visit to Japan as the naturalist of the United States Eclipse Expedition of that year. In all, over 4,000 species of Rhopalocera are found in the collection, the genus Papilio alone having more than 250 species correctly etiquetted in the drawers allotted to them.

In the Heterocera the collection is also rich. By purchase Dr. Holland has obtained the entire collection of the Hypenidæ and Pyralidæ of Japan, made by the late Henry Pryer, of Yokohama. This collection, the formation of which occupied Mr. Pryer seventeen years, is being made the basis of an elaborate monograph of the Pyralidæ of Japan by Dr. Holland, in the preparation of which he will have the assistance of Prof. C. H. Fernald and others.

Recent entomological Publications.—During the past few months a number of very important American entomological publications have been received. We do not feel the same latitude in publishing critical reviews in INSECT LIFE as we should in a private periodical, but important publications should receive some attention at our hands, if only a mere announcement of their publication, for INSECT LIFE reaches a large class of readers whose means of ascertaining just what has been published in an entomological line are otherwise slight.

The first part of Professor Comstock's "Introduction to Entomology" was received some two months since. The title reads, "An Introduction to Entomology, by John Henry Comstock, Professor of Entomology and General Invertebrate Zoology in Cornell University, and formerly United States Entomologist, with many original illustrations drawn and engraved by Anna Botsford Comstock, Ithaca, N. Y.; published by the author, 1888." This first part is a volume of 234 pages, comprising 201 illustrations, and considers the orders Thysanura, Pseudoneuroptera, Orthoptera, Physopoda, Hemiptera, and Neuroptera, leaving the Lepidoptera, Diptera, Coleoptera, and Hymenoptera for the second and concluding part. The work is designed primarily as a textbook. Price $2.

Mr. John B. Smith's monograph of the "Sphingidæ of America North of Mexico" has just been published by the American Entomological Society, Philadelphia. It is a work of 195 pages, based largely on work and material at the National Museum, and is illustrated by nine plates, the plates referring mainly to anal characters and wing-venation.

Dr. Lintner's fourth report on the injurious and other insects of the State of New York has also recently come to hand. Dr. Lintner uses 68 text figures, and his report, including indices, covers 237 pages.

The first and second parts of Mr. Scudder's long contemplated work, entitled "Butterflies of the Eastern United States and Canada, with special reference to New England," have also been received. The work is published by the author and is very elaborate, the illustrations form-

ing a special feature. It is to be issued in 12 parts, each containing 8 plates and about 144 pages of text. The price is $5 per part.

Dr. Packard's Entomology for Beginners appeared in September. It is a condensed treatise of about 350 pages with nearly 300 figures, and is entitled "Entomology for Beginners, for the use of young folks, fruit-growers, farmers, and gardeners, by A. S. Packard, M. D., Ph. D., New York, Henry Holt & Co., 1888." The price is $1.75.

A CONTRIBUTION TO THE LITERATURE OF FATAL SPIDER BITES.

The evidence for and against the possibility of a fatal bite from any of our common spiders is sufficiently confusing. We have, on the one hand, a wide spread impression among people at large that such fatal bites are frequent and a large number of poorly-authenticated newspaper records of cases. On the other hand, we have a general incredul-

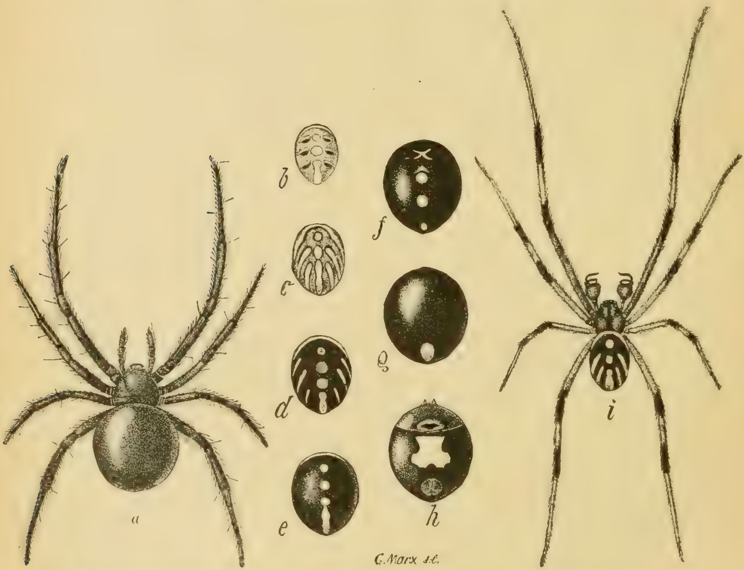


FIG. 46.—*Latrodectus mactans:* *a*, adult female; *b, c, d, e, f, g*, abdomen of different stages and varieties, upper side; *h*, under side of *g*; *i*, adult male. *a, e, f, g, h*, and *i* enlarged twice, *c* and *d* three times, *b* four times (original).

ity among entomologists and arachnologists, who require absolute proof before accepting what seems probably untrue, judged from the statements of naturalists who have allowed themselves to be bitten without bad results, not only by many different spiders, but by the very species said to be venomous.

Under these circumstances any well-authenticated case of poisoning is of value, and we place the following facts on record for what they are worth:

In January, 1886, we received for identification from Col. Thomas B. Keogh, of Greensborough, N. C., a specimen of the common *Latrodectus mactans*, a rather large brown spider, with a red spot on its abdomen, with the accompanying statement that a specimen of the same species had killed a man at Greensborough. We publish our reply in full, as it drew out the interesting statement which follows:

Your letter of the 7th instant, with specimens of spider supposed to be identical with a species which has fatally bitten a man in your neighborhood, came safely to hand. I am glad to get this specimen, the habits of which you so accurately describe, and am much interested in the instance which you report. Such instances have been placed upon record in several papers, but there has been so far no accurate scientific evidence of the power of this insect to inflict a fatal wound. For this reason I should be very glad to hear from you of the circumstances connected with this instance. In the first place, are you certain that the spider which bit the man belonged to this species (the scientific name of the spider is *Latrodectus mactans*, but it has no common name)? (2) Was the spider *seen* to inflict the wound or was it found upon the wound immediately afterward? (3) How long did the man survive the bite? (4) Was the wound a punctured one, and how large was the orifice? (5) What were the symptoms, aside from the spasms which you mention; what was the character of the swelling? (6) Was the man healthy and strong, and what was his susceptibility with regard to other poisons, as the Poison Ivy, for instance? (7) At what time of the year did this occur, and what was the man doing when bitten; was he in a profuse perspiration or not?

The answers to all these questions bear upon the interest attached to it, and you will greatly oblige me by answering them as fully and as accurately as possible. Our best arachnologists would deny the possibility of a fatal bite from these spiders were it not rendered uncertain by such positive accounts as these of yours. In view of this fact the importance of accurate investigation will be readily seen by you. We propose, as soon as opportunity offers, to experiment as to the poison of this and several allied spiders upon rabbits, and thus to approximate a solution of the question.

On receiving this letter, Colonel Keogh handed it to Mr. John M. Dick, who was the employer of the man in question, and whom Colonel Keogh states to be a "very intelligent and well-informed young farmer," who resides about half a mile from Greensborough. Mr. Dick's statement is as follows:

In reply to your questions, asked Colonel Keogh in your letter of January 11, I will make the following statements:

(1) No one was with the man when he was bitten. All we know is his own statement. He said he felt something crawling on his neck; as he brushed it off it stung or bit him very severely. As the pain was very great, he looked to see what had caused it. He described the insect as a black spider with a red spot on it.

(2) He was bitten about 8.30 o'clock a. m. and died between 10 and 11 o'clock p. m., about fourteen hours intervening.

(3) I examined his neck and found about ten little white pimples, all of which could be covered with a one-dollar silver coin. I saw no puncture of any kind.

(4) There was no swelling at all, but his neck and left breast and arm became very hard, so much so that I could not make an impression in the flesh with my thumb.

(5) The man had been living with me for nine years, and was perfectly healthy. Had no disease.

(6) He could handle poison *oak* or *ivy* with impunity.

(7) He was bitten on the 19th of October, 1887. He was hauling wood at the time. It was a damp cold morning and he could not have been overheated. As soon as the sensation of pain had passed off the man felt no further inconvenience till towards the middle of the day. (He described the pain from the sting as somewhat similar to the sting of a wasp.) About half past 11 o'clock he came to the house and told me that he had been bitten by a spider. I treated the matter lightly, thinking he would have been dead by that time if it was going to hurt him at all, but he complained of pains running through his whole body. Finally, he went to town (only 1 mile distant), saying he was going to get whisky. About 1 o'clock he came home. Said he felt no better. Said the pain had settled in his bowels. In a short while he commenced to have spasms. (He told me he had only bought 5 cents' worth of corn whisky.) When the spasm came on I was greatly frightened. As I knew of no remedy but whisky, I gave it to him. In all, I gave him three half pints. He seemed relieved of pain about 3 o'clock, and did some work about the barn. About 4 o'clock the pains came on again and the spasms with them. He had only two spasms. He never recovered from the second one, but remained in a state of unconsciousness till his death.

I have another man working for me who was bitten by one of the spiders about three years ago. I showed him the spider which Colonel Keogh forwarded to you, and he recognized it at once as being exactly like the one which had bitten him. As this man's experience with a spider bite is rather peculiar, I will give it to you as he has told me. He was at work in a corn field about the middle of June. It was the afternoon of the day. He went to a spring near by for a drink of water. While resting a moment at the spring the spider bit him on the ankle. He spit tobacco juice on the sting and soon felt no pain. (He describes the pain from the sting as more like a brier scratch.) He resumed the work, but in an hour or so felt a sudden shock or pain run through his whole body. As one shock would pass off another would come on. He unhitched his horse and attempted to ride home, but soon fell off the horse in an unconscious condition. His employer found him by the road side and had him taken home. This gentleman has since told me the negro seemed perfectly crazy. He told what had bitten him between spasms of pain. The only remedy he knew of was whisky. He gave the negro three pints, and it had no intoxicating effects. The negro had spasms one after another for several days. It was three weeks before he stopped having them, and it was two months before he was able to do any work. He has not entirely recovered yet. Whenever he becomes overheated he has to stop work. He has a numb sensation pass over him. His ankle did not swell at all. These same kind of pimples which I noticed on the neck of the man that died appeared on his ankle, and break out afresh every time he becomes overheated from exercise.

The spider—*Latrodectus mactans*—is congeneric with the well-known "Malmigniatte" of South Europe (*Latrodectus malmigniatus* Walck.), about the venomous nature of whose bite there is so much contradictory testimony.

It will be interesting in this connection to quote a few of the published opinions of naturalists upon this subject.

In the Annals of the Entomological Society of France for 1842, page 205, is a notice of different facts which confirm the venomous property of *Latrodectus malmigniatus*, by Dr. Graells, translated from the Spanish by Leon Fairmaire. He states in brief that prior to 1830, in the district of Tarragone (Department of Cologne), there was no knowledge of any spider which gave poisonous bites, but that in the years 1830, 1833,

and 1841 there were a number of such accidents. He shows that they occur most abundantly in the years of the migratory locusts and shows that such locusts were easily overcome by this spider. The Royal Academy of Medicine and Surgery at Barcelona in 1830 appointed a commission to investigate the dangerous accidents caused during the summer of that year by the spider. The members of the commission were not entomologists and their report was almost worthless. In 1833 there were a number of other cases and Dr. Graells was appointed by the Academy to investigate. He found as a matter of course that the reports were greatly exaggerated. A number of cases were found, however, and investigated, which were unquestionably caused by the bite of this spider, and the following symptoms were recorded:

A double puncture surrounded by two red circles, which unite, together forming an edematous areole which marks the seat of a tumor which develops later. The pain extends and soon occupies the length of the bitten limb, and often reaches to the axillary or inguinal glands, according to the limb bitten. These glands tumefy and become painful and the skin between them and the bite becomes marked with livid spots which seem to follow the course of the lymphatic vessels. The pain continues, reaching the body even to the abdominal and thoracic cavities, with a sensation of burning heat, strong constriction or soreness of throat, tension of the abdomen, tenesmus, and extreme headache, which makes itself felt along the spinal column; soon followed by general convulsions, more particularly in the extremities, followed often by insensibility, especially in the feet, which are ordinarily livid, while the whole body is swollen. This imposing array of symptoms brings about a very marked low spirit on the part of the patients, indicated by their expressions of despair, of profound affliction, or fear concerning the return of the health, for they believe themselves threatened with approaching death.

They continually change from place to place in their bed, giving utterance to sighs and plaintive cries, carrying their hands to their heads mechanically, or they say that they feel their brains pricked by pins. The face is sometimes red and burning, at others pale. The difficulty of respiration is marked, the pulse is very low, quick, irregular, the skin cold and rather moist from an abundant cold and viscid perspiration; at the same time the patient complains that his bowels are burning and asks for fresh water. In some cases the sight is almost totally obscured, the conjunctiva injected; in others the voice becomes weakened, and perhaps a ringing in the ears becomes very marked. Sometimes livid spots appear over the whole body. The intensity of these symptoms varies according to the susceptibility of the individual, to the strength of the Latrodectus, and also the number of bites which the patient has received.

Recovery comes sooner or later, according to the strength of the patient, the energy of the remedies, and the promptness of their effect. In all cases it is announced by the perspiration, which from cold and viscid becomes warm and vaporous; by the quickening and regularity of the pulse; by increasing facility in respiration and urination; by the cessation of the inflammation of the glands and of the aching in the brain and spinal cord, which passes into a sort of lethargy which may be more the effect of the laudanum given than a symptom of the disease.

Mr. Pierret, in the same periodical for 1843, page 8, states that this same spider inhabits Corsica also, and that its bites there cause symptoms similar to those described by Dr. Graells. It appears in the heat of summer and is found principally in houses. When an inhabitant is bitten the remedy consists in exposing the wounded part to strong heat from a furnace and in rubbing it with garlic.

On the same page Mr. Lucas announced that he had studied the habits of the same insect in Algeria, where it is frequently found. He states that he never observed that its bite was venomous and that he had himself been bitten several times without any bad effects.

Walckenaer, Histoire Naturelle des Insectes—Aptéres (Paris, 1837, p. 177 *et seq.*), makes the following statements:

However violent may be the effect of the venom which a spider injects into the puncture which it makes in the body of an insect which it seizes, this venom in the largest species in the north of France produces no effect upon man. I have allowed myself to be bitten by the largest species of spiders around Paris without consequent swelling or reddening. These small punctures have given me no other sensation than would have been produced by a pin or a needle which I had stuck into my finger. In fact, the venom of a spider has not even as great an effect upon man as that of a wasp, a bee, a bed-bug, a flea, and even still smaller insects. We see people not uncommonly who have probably been bitten by some one of these insects and who attribute the consequent results to the bite of the spider because it is often the first insect which they see when they find themselves awakened in the night by the pain. The spider, frightened by the unexpected approach of some person or by a light, runs to hide itself and thus has all the appearance of a culprit.

In warm climates, where very large spiders are found. the bite may be stronger and in consequence more painful, and, in time of extreme heat, with unhealthy persons, the slight inflammation which results from the bite may produce fever, and fever may bring about delirium without the action of any poison. It is thus that we explain the extraordinary effect attributed to the Tarantula de la Pouille and of the *Latrodectus malmigniatus* in the island of Corsica. The facts, from my point of view, have been greatly exaggerated; the observations upon which they are founded are all old, and even at the time when they made the most noise several judicious observers have treated them as fables. * * * [Here follows a short account of the Tarantula mentioned above.] They attribute to the *Latrodectus malmigniatus* of Sardinia the same effects as to the Tarantula. The species of this genus are, however, much smaller, but in America as in Europe they are considered venomous.

Azara has had several of his negroes bitten by the great *Mygale avicularia* of South America. He remarks that a fever of twenty hours' duration often results from these bites, and that it is sometimes accompanied by a little delirium, but that it never has serious results.

Again, in treating of the "Malmigniatte" under his specific description, Walckenaer says:

This species is believed to be very venomous. Its bite causes with man, so it is said, pains and even fever. Mr. Luigi Totti, physician of the Madeleine Hospital at Volterra, in a long memoir which he has sent to us, confirms all that has been said about the effects produced by this spider by Boccone, Keyslcr, Rossi, and others, although its mandibles are not very large and it is not large itself. Moreover, Mr. Abbot, who was ignorant of what had been written in Europe upon the genus, says of all three species which he has figured, that their bite is renowned in America; so the fact is certain. * * * Mr. A. Cauro, of Ajaccio, Doctor of Medicine, in a thesis entitled "Explanation of the methods of curing the bite of the *Theridion malmigniatte*, Paris, 1833," page 6, says: "It appears that the venomous character of *Theridion malmigniatte* is not settled, because all naturalists avoid saying that they believe that its bite is very dangerous. It is certain, very certain, that it is very dangerous in Corsica; perhaps it may be fatal under some conditions." Mr. Cauro gives in detail the effects of this bite, which resemble, he says, those of the bite of the viper; but Mr. Cauro, as well as

all his predecessors, has not taken care to assure himself that the sickness that he describes was actually caused by the Latrodectus. He reports no observations—no experience which proves it.

The following paragraphs are taken from an article by Rev. J. Blackwall, in the Transactions of the Linnæan Society of London (Vol. XXI, 1855, p. 31) entitled "Experiments and observations on the poison of animals of the order of Araneidea:"

The numerous accounts which have been published by various authors of the singular effects induced in the human species by the bite of the Tarantula (*Lycosa tarantula apuliæ* Walck.), and of the still more extraordinary mode of cure, together with the serious and sometimes fatal consequences which have been attributed to the bite of the Malmigniatte (*Latrodectus malmigniatus* Walck.), must be regarded as amusing fictions in the natural history of the Araneidae, * * *."

The legitimate conclusion deducible from the experiments seems to be, that there is nothing to apprehend from the bite of the most powerful British spiders, even when inflicted at a moment of extreme irritation and in hot sultry weather, the pain occasioned by it being little, if any, more than is due to the laceration and compression the injured part has sustained.

These experiments do not present any facts which appear to sanction the opinion that insects are deprived of life with much greater celerity when pierced by the fangs of spiders than when lacerated mechanically to an equal extent by other means, regard being had in both cases to the vitality of the part injured, as the speed with which existence terminates mainly depends upon that circumstance. It is true that the catastrophe is greatly accelerated if spiders maintain a protracted hold of their victims, but this result is obviously attributable to the extraction of their fluids, which are transformed by oft-repeated acts of deglutition into the stomachs of their adversaries.

From the entire mass of evidence supplied by the experiments taken in the aggregate, it may be fairly inferred that whatever properties characterize the fluid emitted from the orifice in the fangs of the Araneidæ it does not possess that degree of virulence which is commonly ascribed to it, neither is it so destructive to animal life when transmitted into a recent wound as it is generally supposed to be. Were I disposed to speculate upon the manner in which it affects insects on being introduced by the fangs into their vascular system, I might conjecture that it has a tendency to paralyze their organs of voluntary motion, and to induce a determination of their fluids to the part injured; but I refrain from dwelling upon a suggestion, however plausible it may appear to be, which in the present state of our knowledge of the subject can only be regarded as hypothetical.

The so-called "Katipo" of New Zealand is a poisonous spider, which apparently belongs to the genus Latrodectus, and from the descriptions which we have seen much resembles the North American *L. mactans*. It is referred to by Mr. Taylor in his work "A leaf of the natural history of New Zealand" as "the Katipo—venomous spider—one kind red, and one black with a marked red spot on its back. Their bite appears to be very poisonous, occasioning a violent swelling of the part." Other writers state that Mr. Taylor is mistaken in describing a red Katipo, but agree with him that the one with the black body and red vermilion spot on its back is the most poisonous.

Mr. F. W. Wright, in an article published in the Transactions of the New Zealand Institute for 1869, states that the spider is from one-half to three-fourths of an inch in diameter, measuring across the body and

legs, and that there are two varieties, one of a dark glossy brown or black color, and the other similar, except for a red spot upon the abdomen. Of the immaculate variety he says:

The abdomen is perfectly spherical, like a No. 1 shot, and very glossy; the legs are compact, not straggling. It is found among dead wood in the garden, with a slight web; amongst the rafters of an out-building. The natives have no distinguishing name for either variety; they are both called "Katipo," to distinguish them from the "Punga-were-were," the common spider.

Mr. Wright gives a number of cases, from hearsay, of fatal bites by the red-spotted variety, and describes a serious case in his own practice, which, however, did not result in death. Mr. Wright, in all of the cases which he mentions, seems to have considered that the simple word of the patient that he was bitten by this spider is sufficient. He evidently has no doubt that it was the spider which produced the result. The circumstances of the case which came under his own notice are worth quoting in full:

In the month of December, 1868, a person of the name of John Huff, living near my residence, came into the surgery complaining that he had been bitten on the shoulder by a spider. He was in the employment of Messrs. Archard & Brown, of Stanley Street, Mechanics' Bay. He was occupied at the time in carrying fire-wood to supply the furnaces of a brick-kiln: the wood was stacked near the kiln in sedge or coarse grass; this happened between the hours of 11 and 12 o'clock a.m. At noon he came home to dinner, sat down to table, but upon attempting to eat found he could not open his mouth, or was scarcely able to articulate, in consequence of stiffness about the jaws. He was alarmed, and came into the surgery, when it was difficult to understand what he had to say. All I could learn from him was that he had been bitten by a spider on the shoulder, in the bay. Upon examining the spot, I found the surface raised to an extent as large round as a tea-cup; this elevated surface was white, and was surrounded by a halo of red, not unlike an exaggerated wheal of the nettle-rash. He complained of considerable pain in the part, and during the examination became faint, and soon almost pulseless. His pulse was unusually slow, scarcely counting more than twelve or fourteen beats in the minute. His countenance and the general surface of the body assumed a hue of extreme pallor, which gradually turned to a blue tint. His extremities were cold and flaccid; his respiration almost ceased; and indeed I had fears that he was about to expire. Dr. Pinching being in my house at the time, I called for his assistance. He was astonished at the feebleness and prostration of the patient from such an apparently trifling cause.

From his extreme faintness it was necessary to lay him on the floor, when I applied spirits of ammonia to the wound, which had the effect of lessening the swelling and abating the pain. I also administered ammonia and water, afterwards combined with brandy, in considerable doses; under this treatment his pulse gradually improved, his circulation and respiration became more natural, as was evidenced by his return to a more natural color. Although a stout, strong man, this state of depression remained for upwards of two hours before he was able to return home. In the evening I found him considerably improved, having taken a slight dose of medicine. For several days he could not return to his work, but complained of great lassitude and nervous depression, which he was sensible of for many days after.

It must be evident, from the symptoms of this case, that the man was powerfully affected by a narcotic and irritating poison, which, being absorbed into circulation, affected the heart, brain, and nervous system to a very considerable extent, almost amounting to fatal syncope: that the stimulants, by exciting the heart's action, gradu-

ally aroused the excretory functions, so as ultimately to remove the poison from the system; for although suffering under its influence for a considerable time, it does not appear to have left any permanent effects behind it, for the man has since been in perfect health.

Mr. Wright further states that the Maoris are well acquainted with these spiders, and have always considered their bite very dangerous. The tufts of sedge upon the sea-beach are the favorite haunts of the red-spotted variety, and the natives avoid sleeping in such places. Half a stone's throw inland, however, they do not fear the Katipo. The native remedy consists in rubbing the part and applying hot half-scalded leaves. Formerly the priests were consulted and incantations to the gods of the hills and valleys were supposed to be efficacious.

It will possibly appear to the reader that after collecting this testimony we are as far from the solution of the question, "Do spider bites ever produce fatal results?" as we were before; but it seems to us, after analyzing the evidence, that it must at least be admitted that certain spiders of the genus Latrodectus have the power to inflict poisonous bites, which may (probably exceptionally and depending upon exceptional conditions) bring about the death of a human being. Admitting in its fullest force the argument that in reported cases the spider has seldom if ever been seen by a reliable observer to inflict the wound, we consider that the fact that species of Latrodectus occurring in such widely distant localities as South Europe, the Southern United States, and New Zealand are uniformly set aside by the natives as poisonous species, when there is nothing especially dangerous in their appearance, is the strongest argument for believing that these statements have some verification in fact. It is no wonder that a popular fear should follow the ferocious-looking spiders of the family Theraphosoidæ; but considering the comparatively small size and modest coloring of the species of Latrodectus so wide-spread a prejudice, occurring in so many distinct localities, must be well founded.

As no good figure of our *Latrodectus mactans* has been published, we have had Dr. Marx prepare the accompanying illustrations. The large female was drawn from specimens collected by Mr. Townsend, near New Orleans, La., and the variations were drawn from specimens in Dr. Marx's own collection.

DESCRIPTION OF LEONIA RILEYI, A NEW MELOÏD GENUS NEAR HORNIA.

By Dr. Eugène Dugès, *Guanajuato, Mexico.*

Length, 11^{mm}; diameter, 3^{mm}. Of a more or less dark ferruginous color and covered with stiff hair or black setæ.

Labrum somewhat retracted, anteriorly depressed and slightly emarginate, laterally nearly rounded, punctate, hairy, ferruginous; mandibles conical, stout, curved, apparently broken at tip, which is obtuse with traces of a rupture; maxillæ with two corneous lobes, the external one at tip of the shape of a rounded plate and ciliate,

the internal one sub-quadrate at tip, provided with thick and stiff hairs; maxillary palpi, four-jointed, the last ovoid, much less large than in Hornia. Mentum trapezoidal, *i. e.*, quadrate with the front margin shorter than the posterior; ligula coriaceous, rounded at tip; labial palpi, three-jointed, the last ovoid and of the same form as the corresponding joint of the maxillary palpi; antennæ inserted on an elevation of the front, ten-jointed, first joint the longest and thickest, claviform, second one-half the size of the first, transverse-conical, third conical, thinner, and longer than the second, fourth three-fourths the size of the third, fifth to ninth similar to the fourth, tenth oval, longer than the ninth; joints 5 and 6, 7 and 8 have the tendency to become connate into a single joint. The antennæ are stout and resemble much those of the male Hornia. They are longer than the head, punctulate and pubescent. The first two joints are ferruginous, the remaining black; epistoma separated from the front by a short, well-marked, and anteriorly straight furrow, punctulate, ciliate, ferruginous; eyes small, decidedly transverse; head trapezoidal, a little wider than the thorax, posterior margin straight, angles rounded, surface strongly depressed, with sparse black pubescence; color ferruginous.

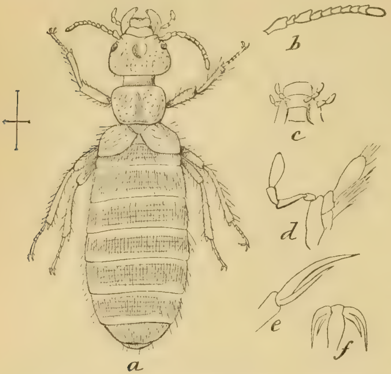


FIG. 47.—*Leonia rileyi*: *a*, adult female; *b*, antenna; *c*, labium; *d*, maxilla and palpus; *e*, tarsal claw from the side—enlarged; *f*, tarsal claw from above, still more enlarged (from drawings by Dugès).

Prothorax strongly transverse, one-third wider than long, a little narrowing posteriorly, side margin straight or nearly so, anterior angles strongly rounded, posterior angles less so, base slightly margined and sinuate; dorsal channel obsolete, surface shining, punctate, ferruginous, covered with black hairs.

Scutellum large, slightly transverse-triangular, rounded at tip, punctate, black.

Elytra squamiform, but larger than in Hornia, for they nearly reach the middle of the first abdominal segment. They meet at the tip of the scutellum with their internal humeral (sutural) angles, but diverge thence so that a small portion of the metanotum becomes visible; rounded at the side and subangulated at the internal margin; the angle which is here visible may be said to be the internal apical angle. Surface coriaceous, rugose, punctate, testaceous, covered with black hair. It is hardly necessary to state that the elytra do not cover the side pieces of the sternum. No underwings. Metasternum very short.

Abdomen normal, *i. e.*, very little inflated and in no way baggy (*en besace*); all segments entirely subcorneous, though less so on the ventral side than dorsally. Last dorsal segment very small, rounded at tip, last ventral a little larger and emarginate. All segments blackish-brown with anterior and posterior borders ferruginous, excepting the two last segments which are entirely black. The whole abdomen is shining and pubescent.

Legs ferruginous, covered with black hair. All coxæ conical and very prominent, the intermediate impending on the posterior, just as in Hornia, although the overlapping is here more marked. Femora slender without silky emargination; tibiæ slender, also without emargination and with well developed spurs, those of the hind tibiæ large and rounded at tip. Tarsal joints slender. Claws reddish, long, curved, and acute, on the underside provided with a long, straight, acute spine, attaining three-

fourths the length of the claw and which represents, in our opinion, the lower division of the claw in the other Meloidæ. This spine is longer and thicker than in Hornia, where it is but little visible, and hardly one-fourth the length of the upper division. Otherwise the claws of Leonia entirely resemble those of *Sitaris muralis* and Hornia.

The insect just described is closely allied to Hornia. Still we believe it deserves to form a separate genus which should enter the tribe proposed by us in our "Synopsis des genres de Méloides du Mexique" (Bull. de la Soc. Zool. de France, ix, 1886, p. 1) between the "Méloides vrais" and the "Cantharides" of Lacordaire (*Meloini* and *Cantharini* of Le Conte and Horn) for the genus Hornia. This tribe could be called *Hornii* (*Horniides*) if this new division should be adopted, which would thus comprise already two genera, Hornia and Leonia.

The important characters of this Meloïd are: the overlapping of the posterior coxæ by the intermediate ones, the very short metasternum, and the side pieces of the sternum not being covered by the elytra. These characters approach it to Hornia, from which genus it differs in the number of antennal joints, which is certainly only 10 in our specimen (possibly a sexual character, but if so, we should say not a less remarkable one); further in the form of the prothorax, which is by no means elongate or campanulate but rather cordate; in the much larger elytra, the metasternum being much less visible; in the abdomen being not much inflated and sub-corneous in all its parts; and finally in having that long spine which represents the lower division of the claws. It approaches the *Sitarini* in the form of the elytra and claws, but the characters just mentioned remove it so decidedly that in our opinion it can not be associated with that tribe.

We have so far seen only two specimens of *Leonia rileyi*. One is that we have just described; the other was sent by us to Europe to Mons. Auguste Sallé. We have found them on the walls of a dwelling-house of the Hacienda de Jupátaro, State of Guanajuato, Mexico. At that place we also observed some probably undescribed Anthophoras, from the nests of which the beetles probably had emerged.

I have dedicated this new genus as a mark of friendship and esteem to my friend, Dr. Nicolas Leon, Director of the Mechoacano Museum of the city of Morella, capital of the State of Mechoacan, Mexico, a scientist already well known whether in Mexico or in Europe and the United States, as a bibliophile, antiquarian, and naturalist. In regard to the name of the species, I have given it that of *rileyi*, in honor of Dr. C. V. Riley, the learned American who first drew our attention to the remarkable peculiarities of this insect (which in our Synopsis we had placed, with some reserve, in the *Sitarini* under the name of *Hornia mexicana*) and who was kind enough to send us a pair of *Hornia minutipennis* Riley, which served us for comparsion.

ON THE EMASCULATING BOT-FLY.

(*Cuterebra emasculator* Fitch.)

Since the publication by Dr. Fitch in his Fourth New York Report of his long and interesting account of this insect, it has received little notice from entomologists. Dr. Fitch's article attracted great attention, and the fact that a bot-fly existed which, according to his statements, apparently bred only in the testicles of Chipmunks or Gophers and Squirrels was certainly a remarkable one. Dr. Fitch succeeded in rearing but one adult which issued about July 29, 1857, from earth in a jar in which the larva had been placed September 1, 1856. So far as we know this is the only adult of the species which has ever been reared.

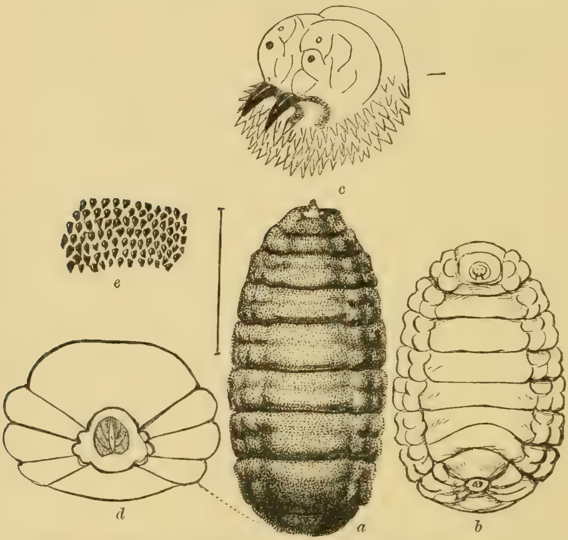


FIG. 48.—*Cuterebra emasculator*: *a*, full-grown larva from above; *b*, same, from below—enlarged; *c*, head of same; *d*, anal end of same; *e*, portion of integument of same—still more enlarged (original).

Dr. Fitch published a painstaking description of the different stages and gave the species the name of *Cuterebra emasculator* from the larval habit which he supposed characteristic. He mentions the fact that hunters in the vicinity of Lakeville, N. Y., where the first specimen sent him was found, had long been familiar with the fact that at least one-half of the male gray squirrels shot in that vicinity were found to be castrated, and that it was the opinion of hunters that the deformity

was caused by the squirrels seizing and biting out the testicles of their comrades. In support of this idea he gives the testimony of Mr. Hurst, taxidermist of the New York State Cabinet of Natural History, who claimed to have seen a half dozen red squirrels unite in mastering a gray one and castrating him. Dr. Fitch queries whether the bot-fly may not be attracted by the wound so made, if this habit prove common, but concludes that the object of the joint attack of several upon one is rather to kill the grub which is engaged in emasculating him.

Unfortunately there is yet some doubt as to whether Fitch's species will hold. Brauer, in his Monograph of the Œstridæ, page 232, quotes Fitch's description at length, and states that he can not separate the species from *Cuterebra scutellaris* Löw, a North American species, the habits of which do not seem to be known.

If this interesting insect has not attracted much attention of late years from entomologists, it has not failed to be noticed by zoologists and taxidermists, although we are not aware that observations have been published. The following statement was written at our request by Dr. Merriam, the Ornithologist of the Department, as we had learned by conversation that he had made notes some years ago on the abundance of the insect in New York State:

In reply to your inquiry concerning the occurrence of Cuterebræ in squirrels, I would state that during many years collecting in the Adirondack region of northern New York, particularly along its western border, in the Black River Valley, I frequently found Cuterebræ in or near the scrotum in the Gray Squirrel (*Sciurus carolinensis leucotis*), Red Squirrel (*Sciurus hudsonius*), and Chipmunk (*Tamias striatus lysteri*). I have observed the same thing at East Hampton, Mass., and in other localities. The most extraordinary instance of the prevalence of this disgusting parasite that has fallen under my observation was at the south end of Lake Champlain, New York, in October, 1885. On the 7th and 9th of that month I killed more than fifty Chipmunks (*Tamias striatus lysteri*) within a few miles of old Fort Ticonderoga and on the rocky side hill behind the town of Whitehall. Of these a very large percentage—I think fully one-half—were infested with "wabbles" (Cuterebræ). More females than males were thus afflicted. The "wabbles" were usually situated near the median line, and anywhere from the umbilical region to the genitals. In a few cases they were in the axilla, and in one or two instances in the upper part of the foreleg. In a number of individuals two Cuterebræ were found and in a few cases as many as three.

Dr. A. K. Fisher tells me that he collected a number of Chipmunks about the south end of Lake George, Warren County, N. Y., during the latter part of August and first of September, 1882, a considerable proportion of which were infested with Cuterebræ. As many as three were found, in different stages of development, in one animal. A Gray Squirrel killed at Sing Sing, Westchester County, N. Y., contained a Cuterebra in the left pectoral region.

Respectfully,

C. Hart Merriam,
Ornithologist.

It is very possible that the larvæ of more than one species of the genus Cuterebra were concerned in the cases noticed by Drs. Merriam and Fisher, but this point can not be decided at the present time.

The chief object, however, of publishing this note is to introduce careful figures of the full-grown larva not before published. They are drawn from a specimen received through the kindness of Mr. George B. Starkweather, of this city. Concerning the capture of the specimen, which was from a female Chipmunk, Mr. Starkweather wrote, October 19, 1888:

About noon on the 13th my children's pet kitten came in from the grove near our house, in the Rock Creek region, with a "chippy" in its mouth. They rescued it at once, but, although warm, life was extinct. The strange appendage, or abnormal growth which they noticed on the under side, caused them to lay it away carefully in an empty covered cigar-box "to show to papa."

My attention was called to it twenty-four hours later, when the dark-colored maggot was found in one corner of the box nearly motionless. They described the "swelling" as about an inch long and of the shape of a mulberry. There seemed to be a natural opening at its apex over a sixteenth of an inch in diameter with a tinge of a dark liquid about it.

Subsequent inquiry has revealed the fact that squirrel hunters in this vicinity report that these grubs are very abundant around Washington in the common Gray Squirrel, one gentleman, with that freedom from fact-bias characteristic of the amateur hunter, stating that he never shot a squirrel which was not infested by grubs. We will doubtless, therefore, have opportunities for rearing the adult and comparing it with Löw's *scutellaris*.

The larva has already been well described by Fitch, and our figures will illustrate its appearance. The specimen from which they were drawn was evidently full-grown, and has entered the earth in a breeding jar.

EXTRACTS FROM CORRESPONDENCE.

Injurious Insects in Mississippi for 1888.

(1) The Cotton Worm (*Aletia xylina*) was reported from the Homochitto River and Middle Fork Creek bottom after the storm of the 19th and 20th of August, but without doing any serious damage. Winds mostly southeast and east. On September 10 I observed them of three different sizes in my own field, feeding on the second growth of tender cotton leaves. I have noticed on some stalks worms as marked (2*a*) on Plate I, Report IV, United States Entomological Commission, eating on the under side of the leaves, others as marked on same plate (2*d* and 2*h* as well as 2*f*). They continued to eat slowly and made but very little progress in destroying the foliage. Cool nights and hot days kept them at bay during the latter part of September and the first part of October. As some of the most natural enemies of the Cotton Worm observed during this season I will mention one spider (*Oxyopes viridans*); one wasp (*Polistes bellicosa*); one bug (*Metapodius femoratus*); one fly (*Proctacanthus milberti*); one orthopter (*Mantis carolina*). All those mentioned above I have observed myself destroying the worms. The latter did not damage the cotton crop to any extent in this county. During the middle of October they webbed up in all parts of the field, and I observed a large number of Cotton Worm chrysalids destroyed by the larvæ of *Chauliognathus americanus*. I also found some chrysalids devoured by the larvæ of *Cyrtoneura stabulans*, and have likewise found some empty skins of chrysalids containing the puparium of this fly.

(2) The Boll or Corn Worms (*Heliothis armigera*) were very numerous on late corn, and I have found from two to five worms of different sizes in most every ear of corn examined. They likewise damaged the cotton crop to some extent.

(3) The Sugar-cane Beetle (*Ligyrus rugiceps*) has been reported as doing considerable damage to sugar-cane during the early part of the spring.

(4) The Greasy Cut-worm (*Agrotis ypsilon*) was reported from all parts of this county to be very destructive in cotton fields, cutting the plants, and thereby seriously injuring the stand of cotton.

(5) The Cabbage Plant-louse (*Aphis brassicæ*) has been very numerous this past season, seriously injuring the cabbage crop.

(6) The Wavy-striped Flea-beetle (*Phyllotreta vittata*) has been during the past year a great garden pest, and destroyed turnip and mustard plants especially.

(7) The Southern Cabbage-butterfly (*Pieris protodice*) has been, in the larva state, exceedingly injurious to the cabbage family. I noticed some of the butterflies on the 6th of November in our gardens.

(8) I also wish to mention a beetle, the Twig Girdler (*Oncideres cingulatus*) which has been very destructive to hickory and persimmon twigs in this county. I have found them gnawing grooves around the twigs of large rose-bushes in my yard, severing the limb sufficiently to make it fall to the ground by the first slight wind.

(9) The Apple-tree Tent-caterpiller, as described on page 412 of the Annual Report of your Department for 1884, did serious damage to the plum and apple trees in this locality.—[George H. Kent, Roxie, Miss., December 1, 1888.

Larva of Hyperchiria io on Saw Palmetto in Florida.

I send you a very beautiful caterpillar by this mail. I hope it will not be a chrysalis when it reaches you. It preys only on the Saw Palmetto so far as I have observed and does not damage that to any extent. I should be glad to get its name from you. —[Robert Ranson, Canaveral, Fla., December 3, 1888.

REPLY.—I beg to acknowledge the receipt of yours of the 3rd instant and the accompanying caterpillar found feeding upon the Saw Palmetto. This caterpillar is the larva of the common Io Moth, *Saturnia io*, so called on account of the large eye-spots on the hind wings. The caterpillar is a very handsome one, but has the disagreeable property of producing a nettling effect upon the skin when handled. It spins its cocoon at or just under the surface of the ground, and passes the winter in the pupa state and the moth emerges in the spring. This insect is so far from being confined to the Saw Palmetto that this is the first time it has been reported from this plant, so far as we know. It is found upon the greatest variety of plants, and is common from New York to Florida. It is seldom or never reported as appearing in sufficient numbers to be called injurious. * * * —[December 7, 1888.]

Acanthacara similis injuring Pineapple in Florida.

I am forwarding to you by this mail an insect that I have recently found eating the leaves of Pineapple plants. I shall feel greatly obliged if you will kindly let me know what it is and something of its habits.—[A. Haden, Orlando, Fla., December 2, 1888.

REPLY.—Your letter of the 2d instant and the box containing an insect found upon the Pineapple plant have been duly received. The insect is one of our large katydids, but has no common name. Its scientific name is *Acanthacara similis*. But little is known concerning the habits of this insect except that it is a leaf-feeder throughout its whole existence. The manner and place of depositing the eggs is not known. Your Pineapples can doubtless be protected by spraying with a dilute solution of Paris green or London purple. Will you kindly inform us as to the numbers in which this insect appears and the damage it does.—[December 7, 1888.]

SECOND LETTER.—I have to thank you for your communication dated 7th instant, with particulars regarding the insect I forwarded (*Acanthacara similis*). It is only within the last month or two that I have noticed the appearance of this insect on my Pineapple plants, and the damage done so far has been trifling, as I have only succeeded in finding two specimens actually on the plants. The green outer surface and edges of the leaves attacked are eaten, leaving the white fiber exposed, and causing the leaf above the part eaten to wither and die.—[December 15, 1888.

Hylesinus trifolii in Ohio.

Your favor of the 30th ult. received. I am not fortunate enough to be the possessor of the volume you mention, viz: Report of 1878. I have the reports of 1877 and 1879, but neither mentions the Clover Root-borer, so I have had no way of identifying the beetle except from reports and descriptions given in the *Ohio Farmer* and other agricultural papers. But, from all I can learn from the above sources, I am confident that it is *Hylesinus trifolii*. However, to be certain, I went to my field December 5 and obtained specimens, imago and pupa, which I inclose. * * * The tap root of the clover was in every case eaten hollow, and the borers were hibernating in the crevices quite close to the surface of the ground. The past season was the second that the field has been mowed. * * * —[W. B. Hall, Wakeman, Ohio, December 7, 1888.

REPLY.—Your letter of the 7th instant, accompanying specimens, came safely. You are right in your identification of the Clover Root-borer as *Hylesinus trifolii*. This insect has spread greatly in the last few years, and no satisfactory remedy has been suggested beyond plowing under the clover in the spring of the second year and planting some other crop. * * * —[December 11, 1888.]

March 1889

Wisconsin Letter on Cicada septendecim.

* * * There are many strange stories told about them [the Cicadas] and not a few egregious mistakes written about them by authors, some claiming that the male never eats anything during its existence as a perfect insect. * * * They derive their nourishment from vegetable substances. Soft maples seem to be a favorite tree for them to feed upon. I have seen trees several inches in diameter covered with them, their probosces driven into the bark almost their full length, and I could see no difference between male and female; they seemed to feed alike, but I have never seen them thus engaged until about the middle of the afternoon. Their excretion is a clear transparent fluid. * * * The season was an uncommonly growing one; vast numbers of the eggs were grown in and over by the rapid growth. The vast amount of dead leaves seen on the trees was caused by the puncturing of small twigs, and larger ones on both sides. The heavy foliage, when violently moved by strong winds, broke the weakened limbs and but few eggs matured in the broken twigs. I have noticed in blackberry twigs that the newly hatched insects in some cases worked their way into the soft pith when egress was prevented. Among their enemies are hogs, some of which were reported to me as having died from eating too many of them before they took wing. Poultry, birds, and especially crows are destructive to them. One insect that seems to have escaped notice as an enemy is the Soldier Bug. It inserts its long bill into the puncture of the twig and eats the eggs.—[John March, Shullsbury, Wis., December, 1888.

A Proposed Remedy for the Chinch Bug.

Several years ago I had a small rye field intended for green feed, and on one side of said rye field there was Indian corn and on the other there was what we call Texas

sugar-cane, used for green feed also (it sprouts out again as often as it is cut until killed by frost). As the rye was getting ripe, so that the numerous Chinch Bugs could not find any more nourishment in the same, they turned into the adjacent corn field, and on the other side into said Texas sugar-cane. They were in such numbers that they would soon have killed off both crops.

I now set in and tried insect-powder, coal-oil, and other insecticides on them, and being convinced that no poison could affect them, since the whole bug family suck their meals through a bill, I came to the conclusion to kill them with hot water. Since the crops would be killed by the insects anyway, a trial would not hurt, but at the same time I anticipated that neither the corn nor the cane would be hurt by the hot water christening, from the fact that the stems of these plants are enveloped in so many leaves that the insects would surely all be killed before the heat reached the tender parts. So I poured boiling-hot water upon the lower parts of the corn infested with the Chinch Bug, which were black with them, and killed them outright, and with a garden sprinkling-can killed them in the same way on the Texas cane. The result was that the corn and cane were both saved. The corn did not suffer any by the process, and the cane had only some of its outer leaves burned, and grew on all summer. Next year I recommended the same process to some friends who expected to lose their corn by Chinch Bugs. They set out kettles in the fields and saved their corn in the same way, and informed me that the hot water only made the corn grow so much faster, and did not hurt it in the least. I tried steam afterwards, and found it to be as good as, if not better than, hot water. A narrow gauged steam-boiler might be used therefor with the proper pipes and hose, and jets let on the corn-stalks when passing through the rows, and the bugs killed in this way without injuring the corn in the least.

As the Chinch Bug migrates from the wheat or rye fields into the corn or cane, my advice is not to let them come into the latter, but kill them in the stubble or even before the wheat or rye is cut; the farmer might run his boiler along the wheat or rye fields adjacent to a corn or cane field and let jets of steam into the former, killing the insects before they commence to migrate, and as soon as the wheat or rye is cut set your boiler at work, and with proper hose or perforated pipes run over your whole wheat and rye stubble, killing every Chinch Bug on your stubble and at the same time all the young Grasshoppers, which are then just emerged from their eggs to commence their depredations. Steam may exterminate not only Chinch-bugs, but also Army Worms and Cabbage worms. If it is an established fact that Chinch Bugs can be killed by steam on the stubble of each farmer, why not pass laws that each farmer is responsible for the damage of his Chinch Bugs to his neighbors? If a meadow is infested with the Army Worms, our present plan is to make ditches around the infested field and prevent them from marching further, which forces them to turn into chrysalids on the field where they started from, and set loose the millers or butterflies again upon the world, to lay new eggs of destruction for the next year. But if my plan of using steam-boilers on wheels for the destruction of insects were introduced it would be an easy matter to run such a steaming machine over any meadow infested with Army Worms and kill them outright. In like manner a light steamer with perforated pipes set high horizontally might be used to kill the caterpillars on cabbage, since the latter can stand a much greater heat than the caterpillars can. Surely in parts of our country where the Grasshoppers do great injury they might be killed by steam when young.—[George C. Bunsen, West Belleville, Ill., November 8, 1888.

REPLY.—* * * The use of hot water against these insects is very old. You will find it referred to in my Reports on the Insects of Missouri, and briefly mentioned in the Annual Report of this Department for 1887, page 80. Your proposed application of steam by means of narrow-gauge steam-boiler is simply a modification of the old

idea without the indorsement of practical experience. It looks rather well on paper, but is inferior in many respects to the use of a good kerosene emulsion as recommended in the same report.—[November 13, 1888.]

Introduction of Icerya Parasites in California.

I am very glad you consider the identity of the parasite (Lestophonus) found on Monophlœbus and Icerya proved beyond a doubt. The last experiment of sending Monophlœbus on ice proved a success, inasmuch as the majority of flies hatched under the cage in San Mateo, but so far I can see no trace of their progeny. I examined the bush carefully the other day; it appears to me that there are many Icerya that look unhealthy compared with those on surrounding trees.—[W. G. Klee, San Francisco, Cal., November 11, 1888.

Two Species of Anomala injurious to the Vine in the South.

To-day I mail you specimens of two species of beetles from Louisiana, sent me to tell what they are. They are new to me, though the smaller somewhat resembles the Grapevine Flea-beetle. Both are very ravenous feeders upon the leaves of the grape, completely skeletonizing them when the beetles are numerous. They also eat out young buds and tips of shoots. They come in June and July in Louisiana. When disturbed they drop to the ground and the larger feign death for some time, while the smaller at once seek cover, which also do the larger after "possuming" awhile. * * * They promise to be very destructive to vineyards if they should become numerous.—[T. V. Munson, Denison, Tex., January 24, 1887, to Mr. H. E. Van Deman.

REPLY.—Yours of the 24th instant has been referred to me by Mr. Van Deman. The insects which accompany your letter and which you state are eating up your grape leaves and buds belong to two species of a genus of leaf-eating beetles, Anomala. The larger one is *A. marginata*, and the smaller one, *A. minuta*. So far as I know these insects have never been specifically complained of as grape-vine pests, although when very abundant I have no reason to doubt their power for considerable damage. I would advise as a remedy spraying the vines with the ordinary Paris green or London purple solutions at any time before your grapes begin to ripen.—[January 31, 1887.]

Beetles boring in an Opium Pipe from China.

I send you per to-day's mail a vial containing three minute beetles, with their frass or débris. An opium pipe, a curiosity from China, made of bamboo, suddenly proved to be infested with these insects, and it is, in fact, honeycombed with them, for shaking the pipe would give a tablespoonful of the frass, with a number of the insects. I send you three, which are all the live ones I could get.—[S. Lockwood, Freehold, N. J., March 8, 1887.

REPLY.—I beg to acknowledge the receipt of yours of the 8th instant and of the accompanying package containing beetles reared from the bamboo opium pipe. These beetles belong to the genus Dinoderus and are allied to *D. floridanum* Horn, but of course it is a difficult thing to determine specifically the small Chinese insects. I would call your attention to the article by Dr. Hagen in the *Canadian Entomologist* for August, 1886, in which he mentions two Ptinid beetles bred from a bamboo box from Hong Kong.—[March 10, 1887.]

A Grape-vine Flea-beetle in the Southwest.

Inclosed please find specimen of a bug which made its appearance in this valley (Salt River Valley) within the last eight days. It preys chiefly upon the tender leaves of the grape, as you see per sample. This being our first experience here with grape

pests, and the insect being a stranger to us, I inclose these samples for such information as you may be able to give us in the premises, as there is much uneasiness concerning the future crop.—[J. J. Wingar, Tempe, Ariz., April 13, 1886.

REPLY.— * * * The insect damaging your grape-vine is one of the Jumping Flea-beetles and is known as *Graptodera ignita*. It is a close relative to the Steel-blue Flea-beetle of the East (*G. chalybea*), which also injures grape-vines in this way. On a small place it is the custom here to kill the beetles by jarring them on sheets saturated with kerosene, as in the early spring they do not readily take to flight. In the large vineyards the best plan would be to spray the vines with a dilute solution of Paris green.—[April 21, 1886.]

The "Voice" of Vanessa antiopa.

* * * *Vanessa antiopa* has a "voice" similar to *Acherontia atropos*, but evidently not so strong, much finer, but still remarkably loud for its body, proboscis, and for a day-butterfly. I heard it in Europe, in Lorraine, from two Antiopas on a beech-stem walking around each other, and agitating their wings with often-repeated cries, evidently preparing for copulation.

I wrote of it to Dr. Eimer at Tuebingen, but he wanted some larvæ of the Antiopa to study the thing, and I could not find him any, as they are scarce in Lorraine.—[Ch. Wercklé, Ocean Springs, Miss., September 6, 1886.

REPLY.—* * * Your observation concerning the "voice" of *Vanessa antiopa* is new to me, although it may have been noticed before.—[September 10, 1886.]

A Swarming of the Milk-weed Butterfly in 1886.

The following is a brief account of a migratory movement of enormous numbers of the common so called Milk-weed Butterfly observed at West River, Maryland, on the 23d of September, 1886. About 7 o'clock in the morning my son, G. Murray Ellzey, called the attention of myself and several other gentlemen to the fact that "the whole heavens were swarming with butterflies." There were an innumerable multitude of them at all heights from, say, 100 feet to a height beyond the range of vision, except by the aid of a glass. They were flying due southwest in the face of a stiff breeze. Observations upon the flight of individuals between points of known distances apart showed that the rate of movement was not far from 20 miles per hour. Where they originally came from or whither they went we could not tell. They undoutedly came from beyond the bay, which, in that place, is 14 miles across, and they must have been early on the wing. By 11.30 o'clock the numbers had declined, and it was evident the bulk of the flight was over, but for several days a great many individuals, evidently following the migratory movement, were observed.

My brother-in-law, Mr. Daniel Murray, who had been three days previously, viz, on the 20th of September, at Long Green, in Baltimore County, Md., saw a vast multitude of the same butterflies in migratory movement; they were seemingly exhausted in flight and settled on the trees in such multitudes as to give them the appearance of an autumnal forest. I was surprised at the great power of sustained flight exhibited, also at the great distance an individual butterfly could be seen by the unaided eye, at least across the water—not less than 1½ miles.—[M. G. Ellzey, M. D., Washington, D. C., January 20, 1887.

REPLY.—[Acknowledgment of letter, with references to articles which have been published on the subject.]

A Phylloxera on the Pecan.

* * * I send you a fuller specimen of the galls—the fungus growth on the Pecan trees I wrote you of. It only appears where the flowers appear, and in the green state when opened is full of the minutest insects. This is all of the information I can

give and I will be very glad to receive any information as to what treatment you will recommend to prevent any further formation on the tree; and if the tree can be brought to bearing fruit again I shall be delighted. * * *—[Mary E. Winston, Stanton, Miss., December 27, 1886.

REPLY.— * * * These galls interest us very much indeed. They are made by a plant-louse of the genus Phylloxera, but they are not absolutely identical with any which we have heretofore seen. They come nearest to a species of hickory plant-louse which occurs in New York State, and which was named by Dr. Fitch *Phylloxera caryæcaulis*. I would urge you to send us specimens of these galls in the spring and summer. You will find it a difficult pest to get rid of. The only sure method will be to destroy the galls in the early summer, and of course this will be difficult to do; but if you can manage to reach the highest points on the tree by ladders and cut the galls off with a pruning pole, you will find that very few will return next season. You will doubtless recognize the generic name of this insect as being that of the celebrated grape-root pest, but of course your insect is entirely distinct from those on grape. * * *.—[January 4, 1887.]

Anthrenus destroying Whalebone.

Inclosed insects and piece of whalebone, eaten by them, are from Mr. Merriam's establishment. Please examine and give me your report in course of time—address Alfred T. Brown, Rising Sun, Ind. This insect is not very numerous as yet, but as I discovered it here I made inquiry as to particulars, etc. The parties have not considered it as of any importance, but I tell them it may be in time if not investigated and checked.—[John P. Brown, 24 Lincoln Street, Boston, Mass.

REPLY. * * * The insect is one of the common museum pests and is closely allied to the Buffalo Carpet-beetle, and is called *Anthrenus varius*. This insect is a very general feeder, preferring animal substances, and its occurrence upon whalebone, although hitherto not recorded so far is I know, is not at all surprising. Without knowing how the whalebone is stored and without experimenting upon the effect which various insecticide substances would have upon the whalebone, it would be difficult for me to suggest a remedy. If the circumstances are such that the vapor of bi-sulphide of carbon can be used it will undoubtedly kill the beetle in all stages.—[October 15, 1886, to Mr. Alfred T. Brown, Rising Sun, Ind.]

GENERAL NOTES.

RESULTS OF PROFESSOR FORBES'S INVESTIGATIONS ON THE RELATION OF WHEAT CULTURE TO THE CHINCH BUG.

[Abstract from paper read before the ninth meeting of the Society for the Promotion of Agricultural Science at Cleveland in 1888.]

Southern Illinois.—Reports from 193 townships for 1887 show injury to corn, none in 4 (average wheat area in 1886 = 2,100 acres per township); slight in 3 (2,440 acres); considerable in 7 (2,530 acres); great in 30 (2,900 acres); very great in 37 (about 2,100 acres); nearly complete in 89 (2,700 acres); complete in 23 (4,400 acres). Wheat area in 1887 differed from 1886 only in a somewhat lower average; for 1888, from 1,500 acres (Chinch Bug injury to corn none) to nearly 4,100 acres (complete) per township. Corn area for 1887 was 1,800 acres (none) to 3,000

acres (complete), lowest intermediate points reached being 2,150 and 2,400 acres per township.

Western Illinois.—Reports from 124 townships (for 1887 ?) show injury to corn slight in 36 (average wheat area in 1886=1,600 acres per township), moderate in 7 (1,900 acres), considerable in 6 (nearly 2,100 acres); great in 2 (2,600 acres), very great in 2 (not given). Grass injury averaged half that to corn. In 1886 the wheat areas (corresponding to the first four degrees of Chinch Bug injury to corn) were 1,600, 1,900, nearly 2,100, and 2,600 acres, respectively, per township (the remaining grades being represented by too small a number of townships to afford an average). The corresponding acreage of wheat for 1887 was 2,000, 2,400, 3,600, and 3,870, respectively.

Central Illinois.—Reports from 177 townships (for 1887 ?) show injury to corn none in 110 (average wheat area per township in 1886=700 acres); a little in 29 (not given); moderate in 5 (not given); considerable in 11 (not given); great in 4 (not given); very great in 6 (3,100 acres); nearly complete in 11 (2,650 acres); complete in 1 (not given). Wheat area in 1887 was 1,050 acres (damage to corn none), 2,000 (a little), 1,100 (moderate), 2,400 (considerable), 3,000 (great), 3,900 (very great), 3,500 (nearly complete).

Eastern Illinois.—Reports from 94 townships (for 1887 ?) show injury to corn none in 65 (average wheat area per township in 1886=670 acres); considerable in 9 (nearly 1,800 acres); other headings gave too small numbers to average. Wheat area for 1887 was 980 acres per township (damage to corn none), 1,300 acres (a little), 2,200 acres (considerable), other headings too small to average.

Northern Illinois.—Reports show wheat areas for 1887 to be 333 acres per township (damage to corn [in 1887 ?] none), 337 acres (a little), 323 acres (moderate), 357 acres (considerable).

Whole State of Illinois.—Reports from 793 townships (for 1887 ?) show Chinch Bug injury to corn none in 384 (average wheat acreage per township in 1886=700), slight in 121 (1,100 acres), moderate in 30 (1,200 acres), considerable in 47 (1,500 acres), great in 37 (2,650 acres), very great in 48 (2,200 acres), nearly complete in 102 (2,700 acres), and complete in 24 (almost 4,500 acres). Reports from 811 townships for 1887 show average wheat acreage per township to be 952 (damage to corn none), 1,275 (slight), 1,644 (moderate), 1,802 ? (considerable), 3,036 ? (great), 2,423 ? (very great), 2,942 ? (nearly complete), and 4,156 ? (complete). Reports from townships for 1886 show Chinch Bug injury to grass none in 525; slight in 130; moderate in 71; considerable in 56; great in 5; very great in 5; corresponding wheat acreage per township increasing from less than 1,000 (damage none) to 4,400 (very great). Reports from townships for 1887 show average wheat area per township 850 acres (Chinch Bug injury to small grain, including wheat, none), 2,600 acres (considerable), 2,600 acres (very great), and 1,450 (complete).

Combining Chinch Bug injury to small grain, grasses, and corn, the

average wheat acreage per township ranged from 1,008 (no crop injured) to 2,936 (total damage equal to 18 on a scale of 24); numbers between these extremes being somewhat wavering, but on the whole a fairly regular ascending series, falling away at one point to 3.296 [*sic*!] and rising again to 3,296 later on.

AN OLD AMERICAN ACCOUNT OF THE BUFFALO GNAT.

Prof. Herbert Osborn has called our attention to the following short article which we deem of sufficient interest to publish:

In the American Journal of Science, Volume I (1818), there is an article entitled "On the Geology, Mineralogy, Scenery, and Curiosities of parts of Virginia, Tennessee, and the Alabama and Mississippi Territories, etc., with miscellaneous remarks. In a letter to the editor by the Rev. Elias Cornelius." In the body of this paper, on page 328, under the heading "*A Destructive Insect*," occurs the following interesting account of a fly which must certainly be the Buffalo Gnat, and which is, so far as we know, the earliest authentic account of its operations:

But I will not enlarge on a fact already familiar. I will ask your further indulgence only while I communicate a curious fact for the information of the zoologist.

In the Choctaw country, 130 miles northeast of Natchez, a part of the public road is rendered famous on account of the periodical return of a poisonous and destructive fly. Contrary to the custom of other insects, it always appears when the cold weather commences in December, and as invariably disappears on the approach of warm weather, which is about the 1st of April. It is said to have been remarked first in the winter of 1807, during a snow-storm, when its effects upon the cattle and horses were observed to be similar to those of the gnat and mosquito in summer, except that they were more severe. It continued to return at the same season of the year, without producing extensive mischief, until the winter of 1816, when it began to be generally fatal to the horses of travelers. So far as I recollect, it was stated that from thirty to forty traveling horses were destroyed during the winter. The consequences were alarming. In the wilderness, where a man's horse is his chief dependence, the traveler was surprised and distressed to see the beast sicken and die in convulsions, sometimes within three hours after encountering this little insect. Or if the animal were fortunate enough to live, a sickness followed, commonly attended with the sudden and entire shedding of the hair, which rendered the brute unfit for use.

Unwilling to believe that effects so dreadful could be produced by a cause apparently so trifling, travelers began to suspect that the Indians, or others, of whom they obtained food for their horses, had, for some base and selfish end, mingled poison with it. The greatest precaution was observed. They refused to stop at any house on the way, and carried for the distance of 40 or 50 miles their own provision, but after all suffered the same calamities. This excited a serious inquiry into the true cause of their distress. The fly which has been mentioned was known to be a most singular insect, and peculiarly troublesome to horses. At length it was admitted by all that the cause of the evils complained of could be no other than this insect. Other precautions have since been observed, particularly that of riding over the road infested with it in the night; and it now happens that comparatively few horses are destroyed. I am unable to describe it from my own observation. I passed over the same road in April last, only two weeks after it disappeared, and was obliged to take the description from others. Its color is a dark brown; it has an elongate head, with a small and sharp proboscis; and is in size between the gnat and mosquito. When it alights upon a horse, it darts through the hair, much like a gnat, and never

quitsits hold until removed by force. When a horse stops to drink, swarms fly about the head and crowd into the mouth, nostrils, and ears; hence it is supposed the poison is communicated inwardly. Whether this be true or not, the most fatal consequences result.

It is singular that from the time of its first appearance it has never extended for a greater distance than 40 miles in one direction, and usually it is confined to 15 miles. In no other part of the country has it ever been seen. From this fact it would seem probable that the cause of its existence is local. But what it is none can tell. After the warm weather commences it disappears as effectually from human observation as if it were annihilated. Towards the close of December it springs up all at once into being again and resumes the work of destruction. A fact so singular I could not have ventured to state without the best evidence of its reality. All the circumstances here related are familiar to hundreds, and were in almost every man's mouth when I passed through the country. In addition to this, they were confirmed by the account which I received from Col. John McKee, a gentleman of much intelligence and respectability, who is the present agent of the General Government for the Choctaw Nation. He has consented to obtain specimens of the insect for your examination, when it returns again, and will, I hope, accompany the transmission with a more perfect description than it has been possible for me to communicate.

NOTES ON PTEROMALUS PUPARUM.

We found a chrysalis of *Pieris rapæ* filled with the larvæ of this parasite on April 3, the larvæ pupating on the 6th. No further developments took place up to the 18th, when we left home, not to return again until the 20th of May, at which time the entire contents of the chrysalis had transformed to adults. This fully confirmed the opinion expressed by Professor Riley (Rep. Comm. Agr. 1883, p. 112), that a large proportion of them undoubtedly wintered over in the bodies of the chrysalids and emerged the following spring.

On the morning of August 9 we observed a larva of *Pieris protodice* Boisd., in the act of transforming to the chrysalis. Near by, and very evidently watching this transformation, were a male and female of this parasite. The trio were observed several times during the early part of the day, the parasites always on guard, as it were, although the female was several times observed to attempt oviposition, in every case, however, being deterred from doing so by the jerking of the larva, now in a semi-pupal state During one of these visits the male was driven away, but soon returned. About 6 p. m., the last observation of the day, the transformation of the larva, while not complete, had so far advanced as to prevent the radical movements which had characterized its struggles during the forenoon, and the female was busily engaged in her work of oviposition, the male still present as a spectator (?). On the morning of the 10th the chrysalis, now fully developed, was removed and placed in a glass jar, awaiting further developments.

On the morning of the 27th, seventeen days after, the adult Pteromalus were observed issuing from the chrysalis in great numbers. After all had emerged they were counted and found to number 68 males and 4 females. The same parasite had been reared from a similar chrysalis on August 13, but the individuals were not counted.—F. M. Webster.

ANOTHER HUMAN BOT-FLY.

Apropos of the interesting article on "A Man-infesting Bot," INSECT LIFE No. 3 (Vol. I, p. 76–80) it may be in order to call attention to an account of a similar or identical species presented in some "Additional Observations on the Parasites of Man and Domestic Animals," appended to Prof. A. E. Verrill's valuable Reports on the External and Internal Parasites of Man and Domestic Animals, and which does not seem to have been familiar to Dr. Matas at the time of writing his article. In the case recorded by Professor Verrill, in which the insect is referred doubtfully to *Dermatobia noxialis*, it appears that the patient, a resident of Mississippi, became infested in that State, which would indicate an extension of the species into this country, or the occurrence of a very nearly related species here.

In the last report (page 95) it was mentioned that a species of bot-fly lives in the larval state beneath the human skin, forming painful tumors. But such instances had been observed only in the tropical parts of Central and South America. It is, therefore, of interest to record a similar case in the United States. In this instance a young woman twenty-two years old, residing at Meridian, Miss., was the victim of the insect. The larvæ, developed from eggs deposited in the skin by the fly, caused great irritation and pain in the subcutaneous tissues, resulting in large abscesses, from which the mature larvæ finally escaped.

I am indebted to Dr. William B. Fletcher, of Indianapolis, Ind., for a specimen of the larva of the insect which was taken from this patient and sent to him by Dr. James Hughes, who treated the case. Whether it be identical with the South American species can not be determined from the larvæ alone.—H. Osborn.

GEOGRAPHICAL RANGE OF THE CHINCH BUG.

In the section on the distribution of this insect, in Bulletin 17 of this Division, and in the Annual Report for 1887, only two localities outside of the United States were mentioned, viz: Cuba, according to Signoret and Uhler, and Tamaulipas, Mexico, according to Uhler. We have since noticed that Mr. W. L. Distant records it as extending southward through Mexico, Guatemala, and Honduras, and in the Biologia Centrali-Americana records it as captured by Champion at the following points:

Guatemala.—San Gerónimo, Paso Antonio, Panzos, Champerico, and Rio Naranjo.
Panama.—Volcan de Chiriqui, 2,000–3,000 ft.

DAMAGE TO FRUIT BY THE ADULT OF ALLORHINA.

The *Pacific Rural Press* calls attention to the damage done by an Allorhina to ripe peaches in Arizona. The statement is made that it appears after the first summer rains, apparently from the low moist lands, and immediately seeks the peach orchards, where it selects the choicest fruit and ruins them. In case there are no ripening peaches it feeds upon grapes, and even upon growing corn-stalks. It disappears during the latter part of August. When they are plentiful several will

attack a ripe peach simultaneously and devour all of its mellow portion in a few hours. The habits of this beetle seem then to be quite similar to those of the allied species in the east. In the south *A. nitida* is called the "Fig-eater" and it is said to seriously injure grapes. The same species was very abundant in the District of Columbia during last season and at the Benning's Station of this Department the beetle swarmed in great numbers upon the peach trees and ruined a great portion of the fruit. We have always supposed that this beetle only attacked decaying, over-ripe, or injured fruit, but the evidence is now growing so strong that it will attack perfect fruit that careful observations are needed.

THE IMBRICATED SNOUT-BEETLE.

This insect has added another food-plant to its already long list. In the Third Report on the Insects of Missouri we recorded damage to Apple, Cherry trees and Gooseberry bushes by gnawing the twigs and fruit. In 1879 Professor Comstock added to the list Onions, Radishes, Cabbage, Beans, Watermelons, Muskmelons, Cucumbers, Squashes, and Beets. A recent correspondent of the *Prairie Farmer* (Mr. J. P. Coulter, Cramer, Ill., issue of June 23, 1888) records damage to Potato. He states that the insect is fully as destructive as the Colorado Potato Beetle, and that its manner of operating is about the same as the other, except that it probably cuts the stalk off more frequently, and "very generally cuts off the other parts, with the soft undeveloped leaves." The editorial comment ignores the previous discovery upon vegetables, and suggests no remedy. Paris green or London purple, however, will probably prove effectual.

NOTES ON ACRIDIDÆ IN LOS ANGELES, CAL.

Acridium vagum.—Adults taken February 5, May 12, May 17, July 1, August 4, August 29, September 4 (in coitu), and November 13. Frequents tall weeds and trees; they feed on the leaves of orange trees. The females in life are green, variously dotted and marked with yellow; antennæ, a stripe below and another back of each eye, besides a stripe on top of the head and thorax, yellow; wing-covers towards their tips tinged with brown; hind femora marked with black before their tips; hind tibiæ reddish, provided behind with two rows of spines which are yellow, tipped with black; hind tarsi reddish above, grayish-brown below; length, 2¼ inches. The half-grown larva is green, irregularly dotted with darker and marked with whitish dashes; a white stripe on each side of the abdomen and another below each eye; each eye is marked with four vertical dashes, of which the hindmost is widest and east distinct; spines of hind tibiæ white tipped with black. Found July 26 and December 15.

Melanoplus devastator, *affinis* and *cyanipes*.—Adults taken November 13, and *cyanipes* February 4; in coitu October 1.

Lactista gibbosa.—Adults taken January 15, February 5 and 12, April 12, May 12 and 17, July 26, and November 13. It sometimes makes a rattling noise while on the wing.

Encoptolophus sordidus.—Adults taken February 12 and November 13. Several larvæ were taken November 13.

Œdocara strangulata or *Stirapleura decussatus.*—Adults taken February 5 and November 13.

Trimerotropis vinculata.—Adults taken May 12 and 17, June 6, July 1 and 24, and November 13. It sometimes makes a rattling noise while on the wing.

Œdipoda venusta.—Adults seen June 6 for the first time in the sea-son; also seen July 26.

Conozoa wallula.—Adults taken July 1.

Chimerocephala pacifica.—Larva half grown, February 4; adults taken April 28.

Thrincus californicus.—Adults taken only in early spring.—D. W. Coquillett.

CHLORIDEA RHEXIA INJURING TOBACCO.

We have not yet published the fact that during the summer of 1886 the wide-spread and polyphagous larva of this insect did considerable damage to tobacco crops in parts of Georgia and Alabama. We deferred publication awaiting further facts, but it seems desirable that this note should go upon record. The larvæ were first sent us July 10, by Hon. J. T. Henderson, of Atlanta, with the information that they were found upon the bud of the tobacco plant. Specimens were also received from J. S. Newman, of Auburn, Ala., and J. S. Barnwell, of Darien, Ga. The latter gentleman stated that in general the adult of this creature did more damage to his tobacco plants than the large tobacco-worm. When young and about a quarter of an inch in length it lives, according to this gentleman, in the central stalk of young leaves and eats so many holes in them that the tobacco is utterly unfit for market as "wrappers," even if it is good for "fillers." As wrappers are so much more valuable in the market he considered it a terrible blight on the industry in his locality.

FIG. 49.—*Chloridea rhexia*—natural size (after Riley).

So far as we know this insect has never before been recorded as feeding upon Tobacco. Its commonest food-plant in the South is "Ground Cherry" (*Physalis viscosa*), and the other species of the same genus. The larva feeds upon the little bolls of this plant. It also feeds upon other wild Solanaceous plants, and we have found it upon *Solanum seiglinge* in St. Louis. It has been received at the Department from South Carolina feeding upon cultivated Geranium, and in Ohio it feeds upon a Composite of the genus Ageratum. The probabilities are that in Georgia

and Alabama the insect turned its attention from the Ground Cherry to Tobacco for some temporary reason, that the summer of 1886 was an exceptional one, and that the insect will not find in Tobacco a stable food-plant. It is possible, however, that it may become a permanent enemy to the crop. There are probably at least three annual generations in Georgia and Alabama, and the insect winters in the pupa state underground. The pupa was sent to us several times in the course of the Cotton Worm investigation as belonging in all probability to the Cotton Worm, and on page 17 of the Fourth Report of the Entomological Commission (where the insect is considered under the name of *Aspila virescens*) an interesting account is given of this mistaken identity. Should the insect again become abundant upon Tobacco, a good remedy will be difficult to find. The best which we can suggest will be the use of Pyrethrum powder, diluted either with flour or plaster in the proportion of one part to ten.

BIRDS AND THE WHITE GRUB.

Mrs. Mary Treat, in a recent number of *Orchard and Garden*, records observations showing that a family of Brown Thrushes fed abundantly upon White Grubs. She has also seen the Robin feeding upon this larva.

DOSING TREES WITH SULPHUR AND OTHER SUBSTANCES.

There is a prevailing and popular idea that insects may be driven from trees by boring holes through the bark into the wood, placing sulphur therein, and plugging the hole. There are some persons who profess to have tried the experiment with success, to have cleared trees, such as Elms of the destroying worm, etc. Prof. C. V. Riley, Entomologist of the Department of Agriculture, pronounces these remedies fallacious.

"The belief in this efficacy," he says, "is founded on the supposition that the poison passes with the sap into general circulation and with it into the foliage, and is destructive to leaf-feeding insects. It is an entirely unfounded idea, and is based upon ignorance of the fact that the substance remains intact, and is not taken up in the circulation. Instances where it has seemed to succeed have been recorded, and in such cases its apparent efficacy was due to a coincident disappearance of the insect from some other cause. Sulphur which I plugged up in such holes many years ago was found to be perfectly unchanged after many months. All such remedies may be stamped as nonsense."—*Scientific American*, December 8, 1888, vol. 59, p. 353.

ALUM AS A CURRANT WORM REMEDY.

At the Massachusetts Station, Prof. Fernald has been experimenting with alum as a destroyer of Currant Worms, and concludes that "alum

as an insecticide for the Currant Worm is a perfect failure. In explanation of the success reported by various horticulturists in the use of this substance, it is possible some one who tried showering Currant Worms with alum water did it just before they were done feeding, and when they went down into the ground he supposed his application had destroyed them, and at once reported his supposed success in the papers."—*American Garden*, December, 1888, vol. 9, p. 432.

AN AUSTRALIAN EXPERIMENT.

In *The Garden and Forest* (Adelaide, South Australia) for November 1, 1888, Mr. Frazer S. Crawford makes a quite favorable report on the efficacy of the resin and soda compound recommended by Mr. Koebele in our report for 1886, when applied to Orange Aphis and to the "Round Orange-scale" (*Aspidiotus aurantii*). In Mr. Crawford's experiments equal parts of soda and resin were used in order to dissolve the latter more readily. The application almost immediately killed every Aphis on the tree treated, and after a week's time resulted in a change of color of many of the scales. After three weeks many adult females were seen alive, and larvæ were noted on the twigs. Two weeks later some old scales and a few newly formed scales were noted. Mr. Crawford thinks a second application would be necessary to completely free the trees, the young scales and larvæ being easily destroyed by one treatment. Nearly all the infested leaves are said to have fallen from the trees, while those free from scale were uninjured, a somewhat remarkable and hardly possible result.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

JANUARY 3, 1889.—Forty-seventh regular meeting. The reports of the Treasurer, Recording Secretary, and Corresponding Secretary for the past year were presented and accepted.

Mr. C. L. Marlatt was elected an active member of the society.

The annual election of officers followed. It was moved and passed that all the officers be re-elected to a second term, except the Recording Secretary. Dr. Wm. H. Fox was elected to the office of Recording Secretary *vice* J. B. Smith, resigned.

The annual address of the President was delivered by Mr. E. A. Schwarz, who took for his subject "On the Coleoptera Common to North America and Other Faunal Regions." The large number of species taken into consideration was divided into two classes: (1) Those distributed by natural dispersion, viz, the circumpolar fauna, the endemic species common to both North and South America, and the migratory species; (2) those distributed by the agency of man, viz, non-intentional importation, non-intentional introduction, and intentional introduction. The various intricate phases which the subject assumes were discussed and illustrated by examples.

The question was discussed by Dr. Riley, Mr. Smith, Dr. Marx, Dr. Fox, Mr. Howard, and C. R. Dodge from the standpoints of Lepidoptera, Arachnida, and Hymenoptera.

The meeting then adjourned.

TYLER TOWNSEND,
For Recording Secretary.

PERSONNEL OF THOSE ENGAGED IN GOVERNMENT ENTOMOLOGICAL WORK.

The following list embraces those now engaged in Government entomological work, and who will assist in the management of the periodical; those at Washington editorially, and the others as contributors. The force of the Division of Entomology is more or less inconstant, as it consists of both permanent and temporary employés:

DIVISION OF ENTOMOLOGY, U. S DEPARTMENT OF AGRICULTURE.

Entomologist: C. V. Riley.

Office Staff: L. O. Howard, First Assistant; E. A. Schwarz, Th. Pergande, Tyler Townsend, C. L. Marlatt, Assistants; Philip Walker, Assistant in silk-culture and in charge of reeling experiments.

Field Agents: Saml. Henshaw, Boston, Mass.; F. M. Webster, La Fayette, Ind.; Herbert Osborn, Ames, Iowa; N. W. McLain, Hinsdale, Ill.; Mary E. Murtfeldt, Kirkwood, Mo.; Lawrence Bruner, Lincoln, Nebr.; D. W. Coquillett, Los Angeles, Cal.; Albert Koebele, Alameda, Cal.

DEPARTMENT OF INSECTS, U. S. NATIONAL MUSEUM.

Honorary Curator: C. V. Riley.

Assistant Curator: John B. Smith.

☞ For bibliographical purposes it may be necessary to state that, where expedient, the names or initials of members of the force will be attached to their communications. Where initials alone are appended, the full name can be ascertained by referring to the list above given.

Editorial or unsigned articles or notes should be credited to "Insect Life," or where it is desired to give personal credit, to "Riley and Howard." While most of the correspondence of the division is carried on by myself, yet much of it is also attended to by my first assistant, Mr. Howard, who acts as Entomologist in charge during my absence, and otherwise so materially assists in editorial and office work that only those articles signed by either should be considered individual. Illustrations, where not otherwise stated, are drawn by Miss Lillie Sullivan, under supervision.—C. V. R.

U. S. DEPARTMENT OF AGRICULTURE.

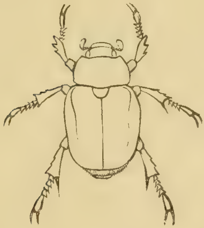
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. FEBRUARY, 1889.

Vol. I. No. 8.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS, WITH THE SANCTION OF THE COMMISSIONER OF AGRICULTURE.



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SPECIAL NOTES.

Mr. T. D. A. Cockerell, of West Cliff, Custer County, Colo., reminds us, after reading the note on the subject of the food habits of the Calandridæ in No. 6 (page 198), that he had sent us a larva found in the base of *Cereus viridiflorus* which we determined as probably the larva of *Cactophagus validus*. It will be remembered that the statement in INSECT LIFE was to the effect that this beetle had been found exclusively under decaying Opuntia leaves. We did not insert this instance in our list of the food habits of this beetle for the reason that the determination from the larva alone might have been incorrect.

Important to Coleopterists.—The edition of the "Classification of the Coleoptera of North America," by J. L. Le Conte and Geo. H. Horn, published in 1883 by the Smithsonian Institution, was so small that it was exhausted almost as soon as issued. The work is indispensable to every student of North American Coleoptera, and in demand from Coleopterists the world over. We are glad, therefore, to learn that a new reprint from the original stereotype plates, undertaken by Dr. Horn, has just been completed. Copies may be obtained for $2.50 each (which includes postage) by addressing the following parties in Philadelphia, Pa: Dr. George H. Horn, 874 North Fourth Street; Mr. E. T. Cresson, Post-office Box 1577; and Dr. A. E. Foote, 1223 Belmont Avenue.

In this number we resume the publication of the much-needed revision of Chambers' Index by Lord Walsingham, whose interest in the Microlepidopterous fauna of North America is a matter of congratulation to all working entomologists on this side of the Atlantic.

The second Shipment of Icerya Parasites.—The December steamer from Australia brought over the second lot of Australian parasites of the Cottony Cushion-scale. Mr. Koebele had informed us by letter that he had forwarded in this lot at least 12,000 healthy living parasites,

mostly in the pupa state, and we had every hope that they would arrive in as good shape as the first lot. We are much disappointed, therefore, to learn from Mr. Coquillett that the shipment reached him in very poor condition on December 9, three days after the publication of a letter from Mr. Koebele to Mr. Klee, which came on the same steamer. Mr. Klee had some difficulty in getting the boxes from the custom-house, and wrote Mr. Coquillett that "when he got them the boxes were all broken up and had evidently been repacked since Koebele packed them for shipment." When Mr. Coquillett received them there were eight tin and two wooden boxes; "all of the tin boxes were mashed flat and their contents were very moldy." There was in them only one living Lestophonus and one of its parasites, one Coccinellid beetle, and a Chrysopa larva. One of the wooden boxes had also been broken open. Mr. Klee, writing later, explains that the ice in the ice-house in which the boxes were confined had fallen upon the packages and smashed some or most of them. It was several days before he could obtain them from the steamer and the contents of those boxes which were partly open were covered with mold. He repacked and forwarded them as soon as he could.

The accident of the falling ice was perhaps impossible to avoid, although carelessness on the part of the steamer hands might have been at the bottom of it. The delay on the part of the custom-house authorities, however, was no accident, and we have taken steps to prevent its recurrence. The Secretary of the Treasury has very courteously issued an order to the collector of the port at San Francisco to allow future packages to enter free of duties and charges, and to forward them unopened and without unnecessary delay to Mr. Coquillett.

A secondary Icerya Parasite.—We were again disappointed, although not surprised, to learn from Mr. Koebele's last letter that he had discovered a parasite of the *Lestophonus* which he has been sending to this country. It was rather to be expected that the hopeful Dipterous parasite would have its enemies, but it was none the less a discouraging thing to find that there is one. Mr. Koebele sent a series of pinned specimens of this secondary parasite to us direct from Australia, and Mr. Coquillett has since forwarded a series which he secured from Mr. Koebele's last sending of the primary parasites. This secondary parasite is a very strange form, and we hope to characterize it in connection with a number of unpublished Icerya enemies in our Annual Report for 1888. It will be sufficient at this time to state that it is a new and remarkable genus of the peculiar Chalcid sub-family *Elasminæ*. Mr. Koebele's warning concerning this secondary parasite was received in abundant time and put Mr. Coquillett on his guard concerning it, and the latter has exercised such care that at last account not one of them has escaped to perpetuate its kind.

Entomological Work at Cornell.—Bulletin No. 3 of the Agricultural Experiment Station at Cornell University contains three entomological articles by Professor Comstock; the first on the Insectary of Cornell University, the second on Preventing the Ravages of Wire Worms, and the third on the Destruction of the Plum Curculio by Poisons. The first article contains a description of the new building which has been erected by the experiment station for work upon insects, with a full-page illustration of the building. The building contains a laboratory for the experimenter and his artist, a workshop and a dark room for photograph purposes; also quarters for a janitor and a store-room for apparatus. In the basement there is a boiler for heating the building and a conservatory with conveniences for potting plants; a coal cellar and a cold-room for the storage of hibernating insects. Back of the main building, which is a two-story cottage, and attached to it, is the conservatory, which is divided by a partition into two rooms each 30 feet in length, one of which is used as a hot-house and the other as a cold-house. Several new devices for use in the study of insects are also described, the most important one being a root-cage for observing subterranean insects. We have for many years hoped to build such an insectarium on the Department grounds to aid us in the laboratory work of the Division, and the fact that plans that would permit the realization of this wish have been before Congress for two years without action very well illustrates the difficulties in accomplishing anything of this sort at Washington as compared with some of our State institutions.

The second article relates the results of a series of experiments in trapping Wire Worms and their parent beetles. It was found that by the baits used—sliced potatoes, unsweetened dough, sweetened dough, and clover—many more mature beetles than larvæ were captured. A number of interesting facts were proved but the principal result arrived at is that by the use of small bunches of cut clover (the best bait) poisoned with Paris green water and placed at intervals through a corn field, under bits of board, large numbers of the parent beetles can be killed.

Sweetened dough, made of one part of sugar to ten parts corn meal and sufficient water to make a dough, was found to be next in efficacy to the clover, although its attractiveness was considerably less. The use of the clover bait is the same idea which we have put into practice and recommended for Cut Worms, and doubtless, in view of Professor Comstock's experiments, the same trap will attract both Cut Worms and Wire Worms. It is noticeable that the Click Beetle, second in abundance of any of those caught in traps, was *Drasterius dorsalis*, and it is worth while to remark that our experience has shown that this insect is quite likely to be a beneficial species, feeding in its larval state, at least a portion of the time, upon other insects. Figure 11 of the paper is unfortunately not named and can not be identified from the illustration.

The third article mentions the feeding habits of the adult Plum Curculio, and details observations which confirm what has long been known to some of us, viz, that this species gnaws holes in apples in August.

THE RED BUG OR COTTON STAINER.

(*Dysdercus suturellus* H. Schf.)

The damage done to the Orange crop in parts of Florida during the present winter by this comparatively well-known pest, has suggested the desirability of a general article upon its life history and habits, which is herewith presented.

GEOGRAPHICAL DISTRIBUTION.

The Cotton Stainer is a native of tropical America and the West Indies, but has long been known as an enemy to the cotton crop in the extreme southern United States. In the Bahamas during the period of cotton cultivation it was perhaps the most serious enemy to the crop. According to the results of the investigation made by a committee of the general assembly of these islands in 1801, this bug preceded all other causes of loss in the cultivation of Cotton. In the winter of 1878–'79 Mr. Schwarz found it in great numbers in the Bahamas, and considers it by far the greatest enemy to Cotton. On and in a single boll he counted 54 specimens, young and old.

That the insect also occurs in Cuba was proved by the receipt of specimens found on a cotton plant in 1879 in Havana, and sent to the Department by Mr. B. W. Law, of that city. We have no knowledge, however, of its occurrence in South America. It is not to be found among the large collections of insects found upon the cotton plant by Messrs. Branner and Koebele during the winter of 1883–'84 at Pará, Maranhão, Pernambuco, and Bahia, Brazil, although many other Heteropterous insects were collected by them upon Cotton. In Florida Mr. Glover found the Cotton Stainer prevalent at Ocala and Palatka in 1858, injuring the cotton plant. In his report for 1875 he again treats of its damage to Cotton, but up to that time it had not, apparently, been reported as damaging the Orange or any other cultivated crop. In our own investigations we have repeatedly met with it in Florida.

FOOD-PLANTS.

The Red Bug as yet damages no cultivated crop except Cotton and the Orange. Mr. Hubbard has, however, observed it feeding upon the seeds of certain malvaceous plants which he was not able to determine specifically. Professor Comstock, in the winter of 1879, found it upon a native species of Rose Mallow (*Hibiscus* sp.), and also upon an introduced species which he calls *Hibiscus fulgidius*, at Maitland, Fla. He

also found it upon the leaves of Guava which were infested by a Mealy Bug, but was unable to determine whether the Red Bugs were feeding upon the leaves of the plant or upon the sweet excretion of the Mealy Bug. According to the Rev. W. F. Nigels, of Dunedin, Fla., it is also found on what is there termed the "Spanish Cocklebur," and upon the "Poisonous Nightshade;" but this statement has not been confirmed by other observers.*

HABITS AND NATURAL HISTORY.

The Egg.—We do not possess authoritative specimens of the egg of this insect to figure and describe, and this is particularly unfortunate, as published accounts of the egg and method of oviposition do not agree. Glover says:

The eggs, to the number of twenty or thirty, are deposited on the leaves or stalks of the cotton-plant (*Gossypium*).

Professor Comstock, in his article previously mentioned, gives the following paragraph to the eggs:

The eggs of the cotton-stainer were sent to the Department in April by Mr. H. S. Williams, of Rock Ledge, Fla. They were laid in a group of twenty-one, upon the underside of an orange leaf. They were amber-colored and oval in shape. The young bugs made their exit through nearly circular holes on the upper side, near one end. The eggs appear smooth and glistening to the naked eye, but an examination with a lens shows them to be densely covered with hexagonal impressions.

Mr. Hubbard quotes Professor Comstock's statement, but is of the opinion that the eggs are not normally deposited upon leaves. "In winter at least," he says, "and around gin-houses, the eggs are dropped loosely in the sand, and among the heaps of cotton-seed upon which the bugs are feeding." Mr. Schwarz, who observed this insect in the Bahamas in the winter of 1878–'79, did not find the eggs, although, had they been laid upon the leaves of the cotton trees, they could hardly have failed to attract his notice, owing to the enormous abundance of the insect in all other stages. He says (Report upon Cotton Insects, 1879, p. 348):

According to the opinion of the natives, the eggs of the cotton bug are deposited in the cracks of the rock. I myself found a number of eggs on the leaf of a plant growing under a cotton tree, but failed to rear the insect, and am therefore not sure that said eggs are really those of the cotton bug.

Mr. Schwarz further says in conversation that both young and old bugs were swarming in and out of the crevices in the rocks and that the supposition of the natives above mentioned is probably correct. There is no soil proper at these places, the vegetation apparently growing out of the coral rock.

It will therefore be seen that the statements of Glover and Comstock are open to doubt in view of the positive observations of Hubbard and

* Mr. Nigels has since sent us specimens of the "Spanish Cocklebur," which proves to be *Urena lobata*, while he writes that the "Nightshade" which he mentions is *Solanum nigrum*.

the negative ones of Schwarz. The eggs described by Comstock are still in the collection of the Department of Agriculture, and a careful examination of the young larvæ which hatched from them at once shows that they belong to a different species (*cf.* Figs. 50, *e* and 51, *a*). We have attempted to learn to what species they really belong, but have been unable to do so on account of the immaturity of the larvæ. The eggs resemble in shape and sculpture those of *Metapodius femoratus* and *Euthoctha galeator*, two predaceous bugs found upon orange, and are intermediate between them in size, but the young bugs differ from either of these species. We have shown these eggs and the young larvæ which hatched from them at Fig. 50. One of the egg-shells contained within it an interesting egg-parasite which will be described by Mr. Howard in another part of this number.

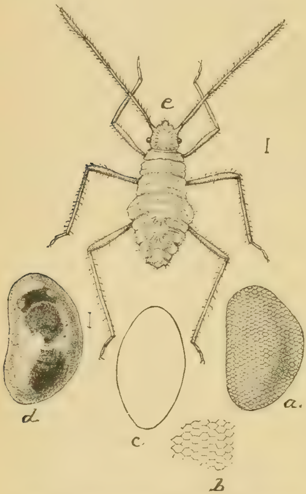

FIG. 50.—*a*, egg taken for that of *Dysdercus suturellus* by Comstock, side view—enlarged; *b*, portion of surface—still more enlarged; *c*, dorsal view of same egg; *d*, same with contained parasite; *e*, larva from same—all enlarged (original).

Comstock's statement having thus been disproved, Glover's becomes all the more doubtful, and Hubbard's account is the only one upon which we can confidently rely. His few words of description of the egg are as follows:

> The eggs are oval in shape, amber-colored, with a pearly luster, and present, under the lens, a pattern of closely reticulated lines.

The other preparatory Stages.—Among the alcoholic and other material of the Red Bug sent to the Department at different times, we have been able to distinguish four preparatory stages which undoubtedly represent separate molts, and, from the gradation in size, probably represent the complete life of the insect. They are shown at Fig. 51, *a*, *b*, and *c*, and Fig. 52, *a*. All were drawn from alcoholic specimens except *b*, which was a dry and somewhat shriveled pinned specimen. This probably accounts for the laterally contracted abdomen of this drawing as compared with *c*. The color in all is bright red, the wing pads in *c* and Fig. 52, *a*, being black, and the lines separating the segments very light yellow. These yellow bands are even more marked on the under side of the abdomen, while the most conspicuous marking, and one which persists through all stages, is the narrow yellow band around the front border of the prothorax just behind the head. All of the legs and the antennæ are reddish-yellow in the first stage, becoming yellowish-brown in the second stage, the tibiæ and tarsi darker than

the femora. In the third and fourth stages the legs and antennæ are yellow-brown, the antennæ darker towards tip, and the tibiæ and tarsi, particularly those of the hind legs, darker than the femora. The sizes

FIG. 51.—*Dysdercus suturellus*: *a*, first stage; *b*, second, *c*, third—all enlarged (original).

of the drawings themselves in Figs. 51 and 52 are not relative, but the length of the hair lines will show the actual size of each stage.

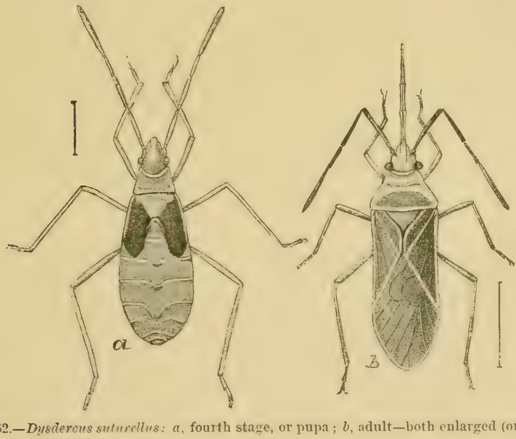

FIG. 52.—*Dysdercus suturellus*: *a*, fourth stage, or pupa; *b*, adult—both enlarged (original).

The Adult.—The adult bug varies in length from 10^{mm} to 15^{mm} (0.4 to 0.6 inch). The hinder portion of the thorax and the wing-covers varies from dark brown to black, the latter being crossed with narrow lines of

light yellow, as shown in Fig. 52, *b*. The head and forepart of the thorax are red, varying from light to dark. The underside of the body is bright red, with the segments outlined by narrow light-yellow bands. The antennæ are black, as are also all tibiæ and tarsi; the femora or thighs are red. The beak is red, except the last joint which is black. All of these colorational markings vary considerably in intensity.

Number of Broods and Hibernation.—We can make no just estimate of the number of annual generations. Wherever the Red Bug is observed it is found in nearly all stages, and individuals have never been carried through their life round. Occurring apparently only in subtropical localities, it breeds steadily all the year round, and insects of all stages are to be found in December and January.

Work of the Insect on Cotton—The Cotton plant seems to be the original food of this species. Mr. Glover's statement concerning its method of work on Cotton is as follows:

> It drains the sap from the bolls by its puncture, causing them to become diminutive or abortive; but the principal injury it does is by sucking the juices of the seed and boll, and then voiding an excrementitious liquid which stains the cotton fiber yellow or reddish, and very much depreciates its value in the market, the stains being indelible. (Ann. Rept. Dept. Agr., 1858, p. 271.)

Of late years the damage done to cotton has not caused much complaint, and indeed Florida is the only State which has ever suffered to any extent by the damage which this insect does to this crop.

Work of the Insect upon the Orange.—Glover, writing upon this species as late as 1875, does not seem to have ever known it to damage oranges, as otherwise he would undoubtedly have mentioned this habit. Shortly thereafter, however, the Red Bug acquired the habit which to-day makes it a serious enemy to the orange crop in Florida. This habit was first called to the attention of this Department in December, 1879, when Mr. S. W. Carson, of Fort Meade, Fla., wrote:

> I send you to-day some bugs which are excessively injurious to sweet oranges after they ripen. The tree from which these were taken had thousands on it. They set to sucking, and never cease until the rind is punctured to the pulp; soon decay sets in, and the fruit drops. Scores will fall off in twenty-four hours. We are ruined in the orange culture if they continue.

In the early spring of 1880 Professor Comstock, then Entomologist of the Department, visited Florida and paid some attention to this insect. He ascertained that the principal injury was done where cotton was planted in close proximity to orange trees, and learned of one instance where cotton was planted between the rows of orange trees with the result that nine-tenths of the oranges were destroyed. As Mr. Hubbard's Report upon Insects affecting the Orange is out of print we may quote his excellent general remarks on the damage to Orange:

> In January and February, if the weather is mild, the Red Bugs desert the fields where they have lingered upon the dead trash and waste of the cotton, and suddenly make their appearance in the orage groves. Usually this takes place only in groves adjoining fields that have been planted in cotton; but, as they are strong fliers, the

bugs not unfrequently migrate in considerable numbers to a distance even of several miles.

At first, only adults are seen; these at once attack the fruit upon the trees. A week or ten days later, the wingless young appear, always upon the ground, clustering upon the fallen fruit. If the trees are not stripped and the fruit harvested before the young brood become adult and acquire wings, the entire crop will be lost. Even the packing-house is not safe from invasion, and fruit is apt to be destroyed after it has been gathered and stored in the bins.

In puncturing the orange, the bugs insert their slender sucking beak, often its entire length, and although the oil of the rind forms their principal food, they nevertheless frequently regale themselves with draughts of juice from the pulp within, and are sometimes seen to suck the juices from the surface of split or injured fruit, tapping it with the tips of their probosces, after the manner of flies.

The sucking-tube, having the fineness of a hair, leaves no visible wound upon the outside of the fruit, and within, no indication of its passage. An orange which has been attacked therefore shows no outward sign of injury; nevertheless, a single puncture causes it to drop in a few hours from the tree, and to decay in one or two days.

It is quite useless to pack for shipment to a distance the fruit from a grove which is attacked by Red Bugs, since the unsound fruit decays in the packages and soon ruins the whole.

During November and December, 1888, damage of this character was reported from Florida. Mr. A. L. Duncan, of Dunedin, Hillsborough County, wrote under date of November 8, stating that it had recently appeared in great numbers in his vicinity, but that it was confined to a few trees. A subsequent letter (November 22) from the same gentleman stated that there is no cotton grown in his neighborhood, "or at least very little," and that the bug was spreading through most of the groves up and down the coast. Under date of January 2 he again wrote that the damage had ceased and that the bugs had almost entirely disappeared. Rev. William F. Nigels, of the same place, writing to the Florida Farmer and Fruit-Grower, December 10, makes several statements which are of considerable interest. His letter, a copy of which was forwarded to us by Prof. Curtiss, the editor of the Farmer and Fruit-Grower, is as follows:

A new enemy to the orange is giving trouble to the orange growers of this peninsula; it is the old-time cotton bug, the insect that stains the cotton in the boll, which gives it a yellowish color and hence lessens its market value. A few years ago this insect was known to exist in two orange groves about 7 miles from here, in one of which the fruit was nearly all destroyed by it, and it seemed to have disappeared. A month ago, however, it reappeared in great numbers in different localities, and it seemed to attack the orange trees at once. As no cotton has been raised here for a number of years, it is difficult to account for its sudden appearance and in such numbers. My own trees have been, thus far, singularly exempt from its ravages, although I have trees in three different fields, while the insect exists in several surrounding groves.

I have occasionally, heretofore, found a few, both young and old, among dead weeds, in fence corners, and where trash had accumulated; but I always destroyed every one I could find, knowing that they did no apparent good and might do evil; and to this precaution and care may be due its absence from my trees. From limited observation, I judge that its habitat is not at all peculiar; as already stated, it can live anywhere and on anything, and survive our light frosts. I have found it mostly

on what is termed here the Spanish cocklebur, but I have seen it also on the poisonous nightshade. Its modest taste seems to have changed of late, and it has found the rich juice of the orange more palatable than juices of wild and noxious weeds; with its long proboscis it pierces the rind of the orange and sucks its sweets until satiated, and every orange thus punctured falls to the ground within three or four days. I have seen every orange from a full tree on the ground, the result of the voracious enemy. Five hundred or more of the insects can be seen on one tree, and a dozen on one orange. The loss to the grove mentioned above amounted to $500.

The question is, is there a limit to its depredations and can it be exterminated?

A brief history of its habits, with directions how to destroy it, would be very timely and prevent much loss.

This orange-feeding habit is then a temporary one in that it is indulged in only while the oranges are ripening and just before picking. During the rest of the year it must feed upon some other food-plant, and if not upon cotton, probably upon some malvaceous plant allied to it. The statement of Rev. W. F. Nigels, quoted under the section Food-plants, would indicate that it breeds upon other wild plants, but here there arises a possibility that Mr. Nigels has mistaken some other allied insect for the Red Bug.

REMEDIES.

It is very important that the most careful observations should be made in the neighborhood of orange groves subject to the attacks of this insect upon the food-plants other than cotton, upon which it subsists during the season prior to its migration to the orange.

Up to the present year the orange crop seems to have been only occasionally damaged, and this is evidently only when the bugs have enormously increased during a favorable season upon their more normal food. These food-plants once discovered for a given locality, a slight examination every year will indicate whether the bugs are increasing unduly, and if this is found to be the case, they can be destroyed in time to prevent the winter damage to oranges. Where cotton is grown near (within a few miles of) the grove, the probabilities are that the bugs will have migrated from the cotton fields after picking, and in such case, and when the bugs seem particularly abundant, it will pay the neighboring orange growers to procure the spraying of the cotton fields with a kerosene emulsion. Where there is absolutely no cotton in the neighborhood, wild malvaceous plants should be watched, and observers should search for whatever other wild plants form the food of the bugs. If this suggestion is followed out the damage done to oranges will undoubtedly be greatly lessened.

When the oranges are actually being attacked, it is difficult to fight the insects. Mr. Duncan, in his letter of November 22, stated that one of his neighbors, upon the first appearance of bugs upon his trees, secured a spraying outfit and a quantity of the Hubbard kerosene emulsion and went to work, but gave it up in two days. The emulsion killed the bugs but others kept coming in, and it was impracticable to continu-

ally spray the trees. He therefore picked the fruit as the only remedy. The same difficulty—that the bugs are continually flying to the groves—will operate against any remedy which may be tried at this time. The only remedy previously published we may quote from Mr. Hubbard:

As was long ago suggested by Mr. Glover, in his report above mentioned, the bugs may be attracted to small heaps of sugar-cane trash with which Paris green or some other poison should be mixed; or the bugs, when collected upon piles of cotton-seed in winter, may be destroyed by drenching them with boiling hot water. The experience of several cotton planters with this last method has shown it to be practicable, but to be effective it must be thoroughly carried out. As the eggs can not all be reached and destroyed by hot water, the operation needs to be repeated several times at such frequent intervals that the bugs are not allowed to reach maturity and deposit fresh eggs.

In the orange grove effective traps may be made with refuse oranges, orange peel, etc., and the bugs, when thus collected, may be destroyed with the kerosene washes used for Scale insects. The kerosene solutions will also be more effective than hot water in reaching and killing the eggs.

As Mr. Hubbard further states, the cultivation of cotton through the orange-growing district of Florida is for many other reasons likely to diminish rather than to increase, and with the abandonment of this cultivation we may expect the Red Bug to do less and less damage to oranges, if not to disappear entirely as an orange pest, unless (and this is not over likely to happen) it should breed extensively upon some wild plant.

CAN THE RED BUG BE USED AS A DYE?

In the old days of expensive dye substances it was thought from the brilliant red color of these bugs that they could be used for some such purpose. Accordingly Dr. Charles T. Jackson, of Boston, was sent a number of these bugs in 1858 from this Department (then a bureau of the Patent Office), and from his report, published in the Annual Report for that year, it appears that the whole substance of the insect could be converted into a rich orange-yellow dye which could be readily fixed upon woolens or silks by the alum-mordant liquor. He also found that an ochreous yellow-lake could be made from them by precipitating the coloring matter with gelatinous alumina.

A PARASITE OF THE SUPPOSED EGGS OF THE COTTON STAINER.

By L. O. Howard.

In the article just preceding this parasite is mentioned and at Fig. 50 is shown one of the eggs which was so transparent that the contained parasite could be quite plainly seen. Carefully removing the egg-shell the parasites were found to be adults and in such perfect condition—evidently just ready to issue—that the following description was drawn

up from them and the accompanying drawing prepared. There is some little doubt as to the length of the wings, for they were, as a matter of course, closely folded and not fully developed. The venation, however, could be easily observed. The only other species of the genus reared in this country is *H. leptocorisæ*, which Mr. Hubbard reared from the eggs of *Leptocorisa tipuloides*, a predaceous bug found commonly on the Orange in Florida.

FIG. 53.—*Hadronotus rugosus* Howard—enlarged (original).

HADRONOTUS RUGOSUS sp. nov.

Female.—Length 1.8 mm. Expanse can not be measured, as the wings of the specimens examined have not expanded. Antennæ arise immediately above the mouth; scape reaches nearly to anterior ocellus; pedicel sub-cylindrical, as long as first funicle joint; funicle joints increasing regularly in width from joint 1 to basal joint of club; joint 1 of funicle twice as long as joint 2, the remaining joints sub-equal in length; joint 2 of club equal to joint 1; joint 3 longer than 2 and pointed. Head and face closely, deeply, and regularly punctate; facial impression shallow, with transverse punctures and with a distinct central longitudinal carina. Mesonotum strongly punctuate, the punctures of the scutum assuming a longitudinal direction. Dorsal surface of abdomen strongly longitudinally rugose, each joint smooth at extreme base and apex, the rugosities strongest upon joint 1, growing slightly fainter on succeeding joints; joints 2 longest, joints 1 and 3 slightly shorter; venter of abdomen with well-marked circular punctures. Entire surface of body with very sparse whitish pilosity. General color black; mouth parts, antennæ, and legs honey yellow, except that the front coxæ, antennal club and pedicel, and first two funicle joints above are brownish. The wings can not be well studied, but seem typical of the genus, and as in *H. leptocorisæ* Howard.

Described from 3 ♀ specimens (♂ unknown) dissected from eggs of Heteropteron, found on Orange by H. S. Williams, Rock Ledge, Fla., in April, 1880, and supposed by Professor Comstock to be those of *Dysdercus suturellus.*

INSECTICIDE APPLIANCES.

MODIFICATIONS OF THE RILEY OR CYCLONE NOZZLE.

By C. V. RILEY.

We have for some time been at work on a Bulletin on Insecticides and Insecticide Appliances, in the preparation of which we have had the assistance of Mr. W. B. Alwood, who, as we announced in the last number, has accepted a position in the Virginia Agricultural Experiment Station at Blacksburgh. There is no certainty as to when this Bulletin will be published, and as we are informed that the condition of the printing fund will probably not justify its publication during this fiscal year we have decided to extract portions of it in advance for the pages of INSECT LIFE. The inquiries which come to us for information upon the subject of the Cyclone or Eddy-chamber Nozzle, whether as to the principles of its construction or as to where it can be obtained, have induced us to take this up first, and in this article it will be our endeavor to give a clear and simple exposition of its features that will permit any good machinist to construct it.

It may not be amiss to emphasize the fact here that this invention is public property, being an outgrowth of our work for the Government, and that all patent claims involving the principle may be ignored by the public. Since the publication of our Fourth Report of the United States Entomological Commission some important modifications have been perfected, especially abroad, and it is to these that we desire to call more particular attention. While the terms "Cyclone" or "Eddy-chamber" apply to the whole class of nozzles constructed on the same principle, it has become necessary to designate some of the modifications by specific names. Usually they have-been given the name of the individual who devised the modification, and, following this rule, the ordinary and original form which we have adopted in this country should be known as the "Riley Nozzle," by which term it is already exclusively known abroad and which it is desirable to adopt for the sake of clearness of statement.

THE TYPICAL RILEY NOZZLE.

As adopted for our work this form is illustrated at fig. 54, which shows the general appearance and detail of structure, with also an outline drawing of an angle-faced chamber.

At A is shown the typical small-stemmed nozzle with the screw-cap *c* above the chamber *a* as it appears when removed from the chamber. The circular body of this cap is chambered out inside and screws down to the bottom of the chamber *a*, the orifice *d* coming in juxtaposition with the orifice *e*, shown in the section at B, in

the wall of this chamber. These parts must meet accurately when lid is screwed down or the working of the nozzle is interfered with. To overcome this somewhat, a transverse slotted opening is sometimes made at *d*. Most of the French modifications make the cap to screw over the outside, but this necessarily increases the vertical depth of the chamber and considerably alters the character of the spray, tending to make it coarser, but at the same time to give it greater propulsive force in a direct line from the discharge orifice.

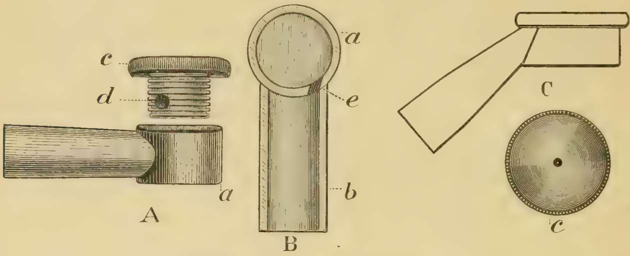

Fig. 54—The Riley or Cyclone nozzle.

For a fine mist of spreading spray the best results are obtained with a shallow chamber like the one shown. The face of the cap should be of fairly heavy metal, countersunk on the exterior surface, leaving but a thin plate of metal at the orifice of exit. The inner surface should never be countersunk around this orifice, as is often done by manufacturers. The section at B shows the construction of the stem and chamber and the tangential entrance orifice at the bottom of the chamber. At C is shown a view of the upper surface of the cap *c*, and also an outline drawing of a chamber placed at an angle of 45 degrees with the stem. This last is an important modification, especially when spraying overhead, as by slightly inclining the supporting-rod the spray can be delivered upward in a nearly vertical direction.

The size of the stem is merely a matter of convenience to suit the desire of the user. In the work of the Division this has been made of suitable size to insert in five-sixteenths or one-quarter-inch rubber tubing, as we found these the most convenient sizes of discharge-pipe to use. A wire wrapped tightly around the tube over the stem makes a perfectly tight joint and answers all purposes.

Of late, however, when it has become desirable to use the different sizes and styles of nozzles for the many and varied purposes to which spray machinery is now put, we have used a stem carrying a female screw of the size to fit a three-eighths-inch nipple. This nipple is made with a stem to insert in the size of the discharge pipe which it is designed to use, and a slight shoulder permits of more secure fastening

of the rubber by wire, which is very desirable to prevent disconnection when great force is used for finer sprays.

A discharge orifice of about one sixty-fourth inch (0.4^{mm}) is the proper size for producing a very fine spray, while for the coarser sprays one-sixteenth inch is commonly used. Between these two dimensions variable volume to suit most purposes will be obtained. For heavy suspension or clogging mixtures the orifice may be still larger.

The Riley nozzles are manufactured, under contract, for dealers by Thomas Somerville & Sons, proprietors of the National Brass Works, Washington, D. C., and by Woodin & Little, 509 and 511 Market street, San Francisco, Cal. The Nöel modification is manufactured by the firm of Nöel, Paris, France, and the Vermorel, by V. Vermorel, Villefranche, sur Rhône, France. In New Zealand it is manufactured and sold by Kutzner Brothers, brassmakers, Masterton, New Zealand. This firm advertise it as the "American Cyclone Nozzle" and make it single and in triplets.

MODIFICATIONS OF THE EDDY-CHAMBER SYSTEM OF NOZZLES IN THE UNITED STATES.

But one modification of sufficient importance to merit attention has appeared in this country, viz:

The Universal Spray-tip.—This nozzle is the invention of John Crofton and L. D. Green, of Walnut Grove, Cal., to whom we are indebted for samples and for an exhibition of its working while in San Francisco two years since. The illustration (Fig. 55) shows its general features.

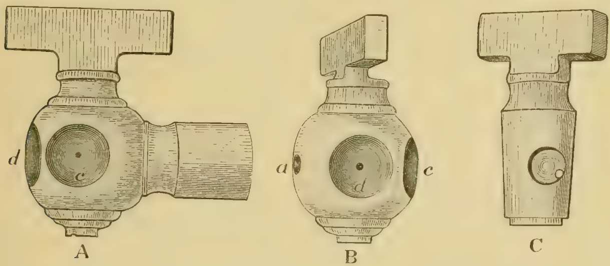

FIG. 55.—The Universal Spray-tip (original).

It is shown entire at A, and is in general form similiar to a water cock. The outer or distal end of the nozzle is shown at B and the plug at C. The spherical body of the nozzle has on its outer surface two countersunk depressions, *c* and *d*, and at the bottom of each is a small circular opening communicating with the orifice in which is inserted the plug C.

It has, also, a larger, straight orifice, *a*, which communicates with the center orifice.

The plug C has two cavities drilled into the body on adjacent quarters, and connected by a small orifice which passes from the shallower cavity tangentially into the base of the deeper one. This will be better understood by reference to Fig. 56, in which is shown a section through the center of the nozzle. This cut represents the water entering the shallow cavity in the body of the plug *b* passing through the cavity *e* and issuing at *c*. By turning the plug rightward, as indicated by the dotted line, the discharge can be delivered at *d*. Thus it discharges sidewise or straight ahead, at the will of the operator. By turning the plug leftward from the position shown in the cut, the discharge will be reversed and delivered at *a*, which is a larger straight orifice and permits the washing out of any sediment or obstruction. When turned half way around rightward from the position shown in the cut, the nozzle is closed.

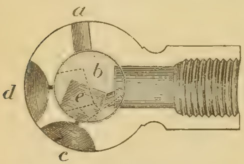

FIG. 56.—Section of Universal Spray-tip (original).

FOREIGN MODIFICATIONS OF THE RILEY NOZZLE.

Foreign modifications of the Riley nozzle are numerous, but mostly of slight practical value. Many of them, and especially the more important, were exhibited at the International Exposition and Congress held at Conegliano, Italy, March, 1886. As a matter of general information to American farmers and fruit-growers we quote freely from the report of Dr. V. Alpe on this exposition, made to the minister of agriculture, industry, and commerce of Italy, printed at Rome, 1887.

Doctor Alpe discusses principally the use of lime-water as a fungicide and the various nozzles by which it is applied; also the most important pumps, etc.

The following quotation (omitting some over complimentary allusions) is from pp. 34–35 of the report. Dr. Alpe has, in this, quoted largely from Professor Cettalini's paper on the exhibit:

> One of the most important points in apparatus for the application of lime-water is that which relates to the atomizer.
>
> The exhibitors at the exposition in Conegliano did not neglect this essential element, and although one can not say that there were presented any very important novelties or solutions of the problem, which were in every respect perfect, nevertheless there was no lack of interesting matter. The typical fundamental atomizer is that of Riley * * * brought to our notice some years since. The atomizers presented at our exhibitions were all more or less effective modifications of the Riley atomizer. As is well known, this consists of a cylindrical box, in bronze or other metal, of varying interior diameter, closed by an empty crystalline-lens-shaped stopper constructed

of the same metal, the center of the stopper having an aperture of 1.5 millimeters, slightly conical, with the base greater towards the exterior.

At the base of this cylindrical box there is an aperture whose axis is in the direction of a tangent to the concave surface of the cylinder. This aperture communicates with a pump by means of an India-rubber tube, which is the distributor. The liquid enters the cylinder with great velocity, there existing a great difference in diameter between the distributing tube and the receiving aperture. By the tangential position of this aperture the liquid is forced to whirl in the cylinder, assuming a rapid rotary motion. When the liquid has filled the cylinder it is forced to pass out by the upper aperture. The molecules of the liquid, continuing this rapid circular movement until the exit is reached, are thrown by centrifugal force first upon the surface of the conical aperture and afterwards into the outer air by combined forces of projecting and rotary motion. When the spirals have reached such a size as to overcome the molecular attraction of the liquid they are subdivided into minute particles forming a mist or spray of extreme fineness.

Dr. Alpe follows with a lengthy discussion as to the availability of the Riley nozzle for spraying lime-water, and concludes that from the nature of the small exit aperture they are not suited to this work.

Professor Scribner, while mycologist of this Department, found, however, that the Vermorel modification of the Riley nozzle (which will be spoken of at greater length further on) is the only nozzle he can use successfully in applying lime-water.

Continuing, Dr. Alpe speaks of the more important modifications of this nozzle which were shown at the exposition, as follows:

In truth, Vermorel, who now constructs the Riley atomizer in France, has endeavored to find a remedy by enlarging the aperture of exit as much as the peculiarities of the construction will admit.

From this it is easily imagined that various persons have thought of modifying the original apparatus of Riley, and among the most noted modifications and which deviate less from the primitive type, and which we saw at the exposition, are those of Ronfini, of Venturini, of Barnabe, of Savoia, of Professor Giordano, and of Nöel.

The first content themselves with slight modifications, while the latter introduce much more radical changes. Ronfini modified the Riley atomizer more in the form than in the essential parts, but Venturini has rendered it much better adapted to the use of hydrate of lime; not only enlarging the circumference, but at the same time furnishing the lower base with a regulator by means of which the jet may be made to bear a greater or less atomizing, according to necessity. Barnabe, instead of this, contrived to avoid the clogging of solid material by attaching a screw to the lower opening in such a manner that it can be opened and closed in an instant, causing the substance which impeded the regular functions of the apparatus to fall of itself, pushed by the liquid which continues to flow.

Savoia placed the air-chamber higher, and in the wall of the receiving-cylinder fixed four blades, which, arranged one above the other, forced the liquid, which rushed from a small lateral aperture, to strike successively from one to the other, revolving twice. More reasonable and better adapted to the apparent object is the Giordano atomizer. This, as usual, is formed of a chamber placed immediately above the place of exit for the liquid from the pump, which is furnished with a thin, movable plate of metal about half way up, having four apertures of sufficient extent placed at an angle of 45 degrees. The solution then strikes against the metal valve before mentioned, divides itself into four parts, and these four jets then reunite, striking one against the other, rush violently into the upper part of the apparatus, there

again uniting they escape to the exterior, forming a cone of liquid much more extended than that which can be obtained by the Riley atomizer.

We have long employed this, and have found it really good, naturally under such conditions as we shall see further on. [Pages 36–37 of report above mentioned.]

Dr. Alpe continues, quoting Professor Cettolini as to the various other styles of nozzles shown at the exposition, and concludes the discussion of nozzles by indorsing Professor Cettolini's views, that a simple rubber tip, which can be compressed and deflexed by a spring, so as to regulate the amount and direction of the spray, is superior, at least for spraying lime solutions, to the metal nozzles.

The more important modifications brought out in France and alluded to in the above extract may now be treated at greater length in connection with drawings of each.

The Nöel Nozzle.—The Nöel nozzle, as made by the firm of Nöel, Paris, is shown at Fig. 57. It is constructed on essentially the same principle as the Riley nozzle, except that the upper parts of the chamber and the discharge orifice are somewhat modified.

The circular chamber is abruptly widened at the top, making in fact a separate chamber of larger diameter superadded to the lower chamber. On the shoulder thus formed rests a circular disk, *d*, flat or slightly concave below, and which plays up and down between the shoulder and removable cap *c*, which closes the end of the upper chamber, a space of about three sixteenths of an inch. The center of this disk is pierced with an opening, as in the Riley, and the upper surface is built up around this orifice, both from its outer circumference and the edge of the central orifice, into a rim surrounding a conical depression in the

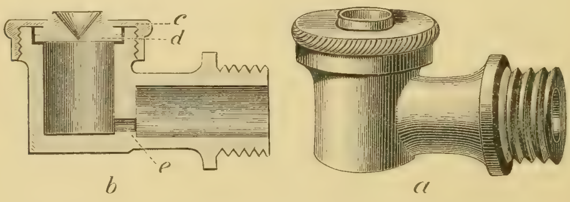

FIG. 57.—The Nöel nozzle (original).

center of the disk This rim, when the valve-like disk is raised, protrudes through the face of the removable cap, and when lowered is nearly on a level with its outer surface.

The liquid on entering the chamber first issues from the central orifice, exactly as in the Riley type, and is diffused in a diverging cone-shaped spray, but the pressure of the whirling liquid rising into the upper chamber forces itself around the valve-like disk *d*, and depressing it, partially issues around the outer rim of the disk in a converging cone of spray, thus interfering with the discharge from the central orifice. It is claimed this tends to greater diffusion and admits of the

passage of a larger quantity of liquid. The nozzle is shown entire at *a*, and in section at *b*; *c* is the removable cap, *d* the movable disk in the upper chamber, and *e* the tangential inlet. This form of nozzle was commended by the judges at the exposition of which we have previously spoken, but in our practice we have found it much inferior to the standard Riley nozzle.

(*To be continued.*)

EARLY OCCURRENCE OF THE CHINCH BUG IN THE MISSISSIPPI VALLEY.

By S. A. Forbes.

The earliest record of the occurrence of the Chinch Bug in the valley of the Mississippi does not antedate 1840, at which time this insect had become sufficiently numerous in Tazewell County, on the Illinois River, to attract attention. I was consequently peculiarly interested by information received last winter from W. T. Shelby, Esq., a police magistrate and notary public of Olney, Ill., to the effect that he personally remembered the destruction of a field of corn in 1828, on his father's farm, opened up to cultivation about 1816, 7 miles north of Albion, the county seat of Edwards County.

Mr. Shelby has lately written me upon this point as follows:

> Chinch Bugs appeared in Edwards County, 7 miles north of Albion, in 1828, the year that Gen. Andrew Jackson was first elected President of the United States, and the Whigs, in derision of the Democrats or Jackson men, dubbed them Jackson bugs. I am not mistaken, as they almost destroyed a field of corn of my father's, the fodder from which the stock did not like to eat.

It is remarkable that an occurrence of such entomological interest should have escaped the knowledge of Thomas Say, living at that time at New Harmony, Ind., 25 miles away, and that his first specimen of the Chinch Bug should have been obtained three years later from the Atlantic coast.

Since the above was written Mr. Shelby writes again:

> I have lately had a conversation with Mr. Elijah Nelson, who made a farm in 1820, 2½ miles west of where Olney now is, and he informs me that Chinch Bugs appeared in the first crop of oats that was sown on that farm, as early as 1823, and that his father told him that these were the same kind of bugs that they had in old Virginia. Mr. Nelson also tells me that in 1832 they appeared in considerable numbers and did some damage to corn.

Inquiry in the vicinity of the much older settlements of Illinois—those along the Mississippi River above the mouth of the Kaskaskia—gives me no hint of the early occurrence of any of the great farm pests; but this is probably due to the fact that the first farms were opened there in the alluvial bottoms of the Mississippi and Kaskaskia Rivers, and that no prairie lands were cultivated for very many years after the settlements were established.

HEPIALUS ARGENTEOMACULATUS.

By D. S. Kellicott, Columbus, Ohio.

This beautiful moth, described by Harris, is known to occur over a rather wide range of the northern United States and Canada, and whilst it is rather uncommon in local collections it must be an abundant insect, at least in some localities; one of these is in Oswego County, N. Y., where I have found the larvæ and pupa-shells in great numbers. Its habits are quite in accordance with those of its congeners, so far as they are known. It bores the roots and stems of the Speckled or Hoary Alder, *Alnus incana.* I have been unable to study the larval habits, except in midsummer or in early spring, as it occurs in the section mentioned above. At the former season the imagos for the year have escaped. At the latter, the mature larvæ are in galleries, often reaching far up into the trunks, and the two broods, as I regard them, which are to mature in succeeding years are mostly in the under-ground portions.

The larvæ of Cossidæ and Ægeriidæ, which live in wood, appear to require more than one year to complete their growth. For example, that of *Cossus robiniæ* requires three years, as the following experiment indicates: July 1, 1882, eggs of this species were placed in a wound in the bark of *Robinia pseudacacia.* The tree selected was isolated and there were no signs that its trunk had been attacked by borers. A part of the eggs gave larvæ, the castings of which were observed from time to time at the place where the eggs were lodged. The latter part of June, 1885, a female pupa shell of the Cossid was found at the same place. Again I have shown, in a high degree of probability, that *Harmonia pini* exists as a borer for three years (*Ent. Americana*, I, 171). So this alder-boring species appears to pass a like period in the roots and stems. I have already referred to the different broods found in spring and summer. Again, I have had larvæ under observation in roots kept moist from July until the following May. They must have been nearly two years old, but did not transform. The failure of the original stumps, and the refusal of the larvæ to make homes in fresh ones, prevented further success.

The life history appears to be as follows: The eggs are laid the first week in June; the caterpillars live for two years in the roots; as the third year advances they work upward more or less into the stems; in the spring of the third year they bore out to the surface, partially or loosely plug the opening with chips, and transform; there does not appear to be a well marked pupa cell, and it travels rapidly up and down its tube for a long distance by means of the transverse abdominal teeth. Pupation occurs about May 1, and moths emerge a month later in the locality cited above. The pupa shells have been found protruding from trunks in a manner quite like those of other Cossids.

An account of the larva and the pupa was read by me at the Ann Arbor meeting (1885) of the Entomological Club of the A. A. A. S. This was printed in *Entomologica Americana*, I, p. 174, and the provisional name *Cossus alni* was proposed. It was not until June, 1888, that I obtained an imago, which proved to be *Hepialus argenteomaculatus.*

The descriptions were as follows:

Length, 1.5 to 1.8 inches. Subcylindrical, tapering very slightly at extremities; slender. Width of body, 0.25 of an inch. Length of smaller ones, 0.8 inch. The head is light yellowish-brown above, black about the mouth parts, hemispherical, smooth or slightly roughened, with a few dark dots, from which arise dark hairs, usually worn off the vertex of the larger examples. The second ring is smooth; lighter colored than the head. Above the spiracle, on either side, there are three black spots, situated at the corners of a right-angled triangle; the upper one, at the right angle, bears a coarse brown hair; the other two have finer, lighter-colored hairs. The top of the third ring is likewise smooth and brownish. The remaining body surface, except the yellowish piliferous spots and top of ring 13, is white. The longer hairs on the posterior rings are black. The body rings are strongly folded transversely. The yellowish dorsal spots bear brownish hairs; the anterior, larger pair are situated near together on the broadest transverse fold; the smaller, posterior pair are situated on a narrower fold, and much farther from the slight dorsal furrow. The stigmata are broadly elliptical; the rings narrow, black, scarcely raised above the surface; the color within the ring light brown. The legs are yellowish; hooks black; the proplegs with very many hooklets.

The pupa is slender, length 1.6 inches, width of thorax, 0.33 inch, but slightly curved and of unusually uniform diameter, smooth, under a lens transversely striate, the three anterior rings black, shagreened; on the prothorax there are two conical protuberances which in profile under a strong lens prove to be double pointed; on the clypeus are two gouge-shaped spines, shining black on outer half, and on the upper roughened base of each of these there is a small conical tooth; on the under side of the head case, below the gouge-like spines, is a pointed spine directed forward; back of this are two smaller cusps, one either side of ventral line, and still farther back, apparently over the first tarsal joint of the fore legs, are two smaller points. The transverse rows of dorso-abdominal teeth are as usual, but the teeth are exceedingly fine, increasing in size but little posteriorly; the black, blunt, anal segment bears several small black conical teeth on either side.

I have found no parasite of this larva, but I have seen that the woodpeckers are its deadly foes. In April, 1886, I had a favorable opportunity to search for the borer and was astonished at the scores removed by these birds. They often drill through a deep layer of wood; often two holes are made one above the other, the purpose being obvious. The morsel is evidently located, or its burrow rather, by sounding, as I noticed many instances in which a row of punctures surrounded the base of the alder. The destroyers are sometimes mistaken, for I found their drillings, evidently made in search of this larva, in sound wood in which there were no borers, but these were few compared with the successful trials.

Is it the activity of these birds that prevents the abundance in the forest of certain borers, *e. g.*, *Aegeria acerni*, whilst the same insect is often destructively abundant in the ornamental maples of cities and villages?

EXTRACTS FROM CORRESPONDENCE.

Late Autumnal Occurrence of Mites in Great Numbers.

Friday, November 7, was a rainy day, and at night a very heavy rain-fall occurred: on Saturday it rained in light showers, grew cooler in the evening and froze hard at night; on Sunday morning a lady riding along asked her husband what that curious sawdust-like stuff was that was scattered along the roadside so beautifully. On examination it was found to be a very small, red-legged, spider-like insect, and that it was everywhere—field, roadside, garden—covering the country for miles. I think it was not more than one-half as large as the tiniest new-born spider I ever saw, although I do not remember to have seen one just from the egg. They were more noticeable in pools and puddles of water—perhaps from their insignificance in size—where they appeared in patches, few or no individuals appearing singly.

Viewed through a microscope of low magnifying power they appeared to be shaped somewhat like a grand-father gray beard or daddy-long-legs; eight bright red legs dangled from their black bodies; occasionally a sort of drab-colored individual might be seen; two white opaque specks on either side, which I fancied might be eyes, adorned one end of the body and a very curiously-shaped dull-red spot the other; no appearance of any web was discernible; they were not at all active, and in about a week the legs began to turn white and drop off, probably because the insect was dead. As none were to be found on our farm after Sunday, and as I am a very busy woman, I had no time to study them. Being very much interested in them, however, I have ventured to write you, hoping that you will kindly tell me what you think about this strange insect, where they so mysteriously came from, and whether they will be likely to appear again, and, if so, will it be to our injury? * * * —[Augusta B. Wisner, Tecumseh, Lenawee County, Mich., November 27, 1888.]

REPLY.—Your letter of the 27th ult., giving an account of the occurrence of a small, red-legged, spider like insect in great numbers in your vicinity after a cold snap, has been received. I am very sorry that you did not save specimens, as I am not aware that anything precisely similar has before been recorded. Your description is quite careful, but you do not give us a definite idea as to size. * * * If you can possibly secure specimens, please do so and forward them to us.—[December 4, 1888.]

SECOND LETTER.—Your letter of December 4 duly received. In answer I will say that I have been so fortunate as to obtain a few specimens, which I shall this day mail to you. Although they have disappeared from our immediate vicinity, I find that at my brother's a great quantity of them remain, and they were observed one day last week crawling all over the buildings and even came into the house and got into the milk. I find this morning that many that I gathered for you must have escaped, but I hope enough are left for you to determine their nature. They were in a deep bottle, and I did not dream of their getting out. I have not changed the water from which I took them, fearing their health might suffer. In a letter from a sister living in Tuscola County, she says: "I have not seen the little insects you speak of, but others have here, or out of town. It does seem strange. Mysterious are the works of Providence." Now there is little doubt that it is the same insect, as I wrote her describing it; and as she lives at a distance of about 160 miles, you will see how widely spread it appears to be. * * *—[December 11, 1888.

REPLY.—Your letter of the 11th instant, accompanying a bottle containing specimens of the mite concerning which you had previously written us, has been received. I am very glad to get these specimens. The material is so rotten that it is difficult to study, but the species is evidently near the genus Tetranychus, which is the genus to which the common Red Spider of our greenhouses belongs. Concerning the habits of this particular species which you send I can say nothing, except that all of the species of the genus, so far as we know, feed upon the leaves of plants, and your species may have been very common on grass or low herbage.—[December 18, 1888.]

Balaninus nasicus in granulated Sugar.

I mail you a box of worms sent to us from Bucyrus, Ohio. They were taken from a barrel of granulated sugar that was lined with several layers of tissue paper. Can you tell us anything about them and how they probably came to be there? I imagine they came from the staves of the barrel, although that is hardly probable, as the wood is kiln-dried before being used for cooperage.—[F. N. Barrett, 143 Chambers Street, New York, November 26, 1888.

REPLY.—I have your letter of the 26th instant and the accompanying box of granulated sugar containing worms from Bucyrus, Ohio. These worms are not sugar-eaters, and their presence in the barrel described was accidental. They are the larvæ of the common Chestnut Weevil (*Balaninus nasicus*), and it is their habit to emerge from chestnuts and enter the ground to pupate. Chestnuts must have been stored or temporarily placed near this barrel of sugar (probably over it), and the grubs, in search of earth, made their way into it. They did not come from the wood, as you suggest.—[November 30, 1888.]

On Thalessa and Tremex—A Correction.

I continue to receive with much pleasure the successive numbers of INSECT LIFE, and in No. 6, to hand a few days ago, was specially interested in your admirable article on the habits of Thalessa and Tremex, and the beautiful illustrations which accompanied it. I must plead guilty to formerly having imbibed too trustfully the statements of well-known entomologists as to the oviposition of Thalessa, and to have thus been led to insert in my paper published in the Canadian Entomologist, Vol. XIV, p. 83, the statement that the egg was deposited in the larva. This was especially unfortunate, as the rest of the article was the result of personal observations. There appears, however, to be a clerical error in your paper on page 172, where I am coupled with Mr. Clarkson as an advocate of the larvæ being lignivorous. It is evident that Mr. Gade was intended for mention.

The description of *Heteropelma datanæ* enables me to place a name upon a species which has been in my cabinet for several years as *sp. nov.*? I have two specimens, both collected here.—[W. H. Harrington, Post-Office Department, Ottawa, Canada. January 7, 1889.

Sap-Beetles in injured Figs.

I send you by mail figs from the same tree showing several stages of injury from the insects. The figs are from a tree about four years old, growing in a sandy-loam soil made rich with stable manure and cotton seed. The piece of ground upon which stand the trees is about 65 by 75 feet and bordered on north and northeast by brick wall, east by brick house, and south and west by paling fence. The trees were somewhat severely bitten by cold last winter, but have borne a very heavy crop of fruit this summer. The brown insect begins to infest the fruit by entering the end furthermost from the limb as soon as the fig begins to mature and get ripe. You notice there are two kinds of the insect—one a brown, size of a weevil; the other almost microscopic, dove-colored. They destroy my entire crop of figs. What are they, and is there any remedy against their ravages? I have other kinds of figs, but they are not so bad on them.—[J. C. Richardson, Greenville, Ala., September, 1886.

REPLY.—* * * The numerous small insects which are found swarming in the figs sent by you represent several species of the Coleoterous family (*Nitidulidæ*), popularly known as Sap-beetles. The largest and most abundant species among them is *Carpophilus mutilatus*. Three other species, viz, *Colastus niger*, *Colastus truncatus*, and *Carpophilus marginatus*, were much less frequent. The small white larvæ of these beetles work also upon the figs. These Sap-beetles can not be considered as injurious, since they are not capable of puncturing the rind of their own accord, and they only enter such fruits as have been previously injured by some other insect. They feed upon the decaying pulp. Within the limits of the cotton belt the notorious Cotton-

worm Moth is well known to be greatly injurious to ripening fruit, especially to figs, by boring through the skin of the fruit with their probosces and sucking the juice. The Sap-beetles afterwards enter through the opening made by the moth, simply hastening the decay of the fruit. It is very probable that the injury to your figs has been caused in this way; and, if so, the only way to protect your trees will be to induce the neighboring cotton planters to poison the Cotton Worm.—[September 30, 1886.]

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX* WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord Walsingham.

[*Continued from page* 150.]

In addition to the species already known from North America (all of which will be included in the finally revised Index which is proposed to be published in portions as these papers proceed) I am now able to give descriptions of several new species from different localities and to add further notes to facilitate the recognition of already described forms. As each genus is dealt with the portion of the Index referring to it has been privately printed and each portion is therefore available for publication at any moment; but it has been thought advisable to hold it back until a more considerable section of the whole has been completed.

DEPRESSARIA Hw.

Depressaria togata sp. n.

Antennæ, purplish-fuscous.

Palpi, cinereous, speckled with fuscous externally on the second joint; apical joint entirely suffused with fuscous, with the exception of the extreme apex which is ochreous.

Head, dull grayish-ochreous; face paler.

Thorax, cinereous speckled, with fuscous.

Fore-wings, pale grayish-ochreous, thickly suffused and streaked with purplish-fuscous; the markings ill-defined, consisting of a dark fuscous patch at the base of the dorsal margin, a dash of the same color immediately above the middle of the wing at one-third from the base, followed by some pale grayish-ochreous scales; a pale grayish-ochreous spot on the middle of the wing at about the end of the cell is preceded and followed by fuscous scales, and beyond and above it are several fuscous dashes radiating outwards to the costal and to the upper half of the apical margin, where is a row of obscure fuscous spots preceding the somewhat paler and mottled cilia.

Hind-wings, pale shining whitish gray, with the cilia scarcely darker in which a slight tinge of grayish-ochreous is traceable.

Abdomen, grayish-ochreous.

Exp. al., 20^{mm}.

Habitat, Montana.

Type, ♂, *Mus. Wlsm.*

This species is distinguished by its very pale hind-wings, contrasting strongly with the dark fore-wings, which remind one much of the European *albipunctella*. The

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* Index to the Described Tineina of the United States and Canada. V. T. Chambers. Bull. U. S. Geol. and Geog. Surv., IV (1), 1878.

neuration of the hind-wings as well as their color serves to separate it from that species; veins 3 and 4 of the hind-wings being from the same point, whereas in *albipunctella* they arise from a short stem.

This species belongs to the group in which veins 2 and 3 of the fore-wings are separate.

Depressaria cinereocostella Clem.=clausella Wlk.

Writing on this subject in the P. Z. S., 1881, p. 312, I mentioned that Clemens's paper in which it was described was published at some time during the month of March, 1864, and that the volume XXIX of Cat. Sp. Het. B. M. containing Walker's description of *clausella* was dated March 7, 1864. Some additional information, for which I am indebted to Mr. E. T. Cresson, of Philadelphia, and to Mr. Butler, of the British Museum, justifies me in giving precedence to Clemens's name, the volume of Walker's Catalogue having been submitted to the trustees of the British Museum before publication, on June 25, 1864, whereas Clemens's paper in the Proc. Ent. Soc. Phil., II, 422, was laid upon the table of the Entomological Society of Philadelphia on May 9, 1864, and had probably been issued to the subscribers some weeks before.

Depressaria solidaginis sp. n.

Antennæ, purplish-cinereous.

Palpi, cinereous, second joint roughly clothed, with a divided brush beneath; apical joint with an obscure fuscous ring near the base, a wider and more conspicuous one near the apex, and the extreme tip also fuscous.

Head, cinereous touched with reddish brown above; face whitish.

Thorax, purplish-cinereous, tufted posteriorly.

Fore-wings, cinereous, blotched and speckled with purplish fuscous, especially about the outer one-half of the cell and at the base of the dorsal margin; three small blackish dots at one-third from the base, the two upper on the disk, obliquely placed, and followed by some very pale cinereous scales, the third on the fold straight below the outer and lower one of the pair; slightly beyond the middle of the wing and in a direct line with the middle dot is a very pale cinereous spot surrounded with darker scales, the outer portion of the costal margin has four or five dark, purplish fuscous patches forming a continuation of the row of dots of the same color, five in number, which extend from the anal angle along the apical margin, the whole series being preceded by some ill-defined longitudinal dark fuscous streaks; three of these are connected with the costal spots, the other three do not reach the corresponding spots on the apical margin; cilia, grayish-cinereous, with a slight lilac lustre.

Hind-wings and cilia, pale grayish, with a faint lilac luster.

Abdomen, grayish-cinereous, clouded with fuscous posteriorly.

Exp. al., 22^{mm}.

Habitat, Kirkwood, Mo.

Larva on Solidago.

Type. ♂, *Mus. Wlsm.*

A single specimen received from Miss Murtfeldt in 1884, bred from *Solidago.*

This species belongs to the group in which veins 2 and 3 of the fore-wings arise from a common stem.

The larva of this species is probably that which is described by Coquillett (Pap. III, 97–8) under the name *pulvipennella* Clem., for I find that Professor Fernald named Mr. Coquillett's specimens, and has also identified specimens of this species for Miss Murtfeldt as *pulvipennella* Clem., which do not correspond with specimens of *pulvipennella* in my own collection that were compared with Clemens's type in the collection of the Entomological Society of Philadelphia.

Depressaria fernaldella sp. n.

Antennæ, dull cinereous, basal joint touched with tawny and fuscous scales.

Palpi, tawny-reddish beneath, above pale cinereous mottled and blotched with blackish scales on the second joint; a spot at the base, a broad ring above the middle and a minute spot at the apex of the terminal joint, also blackish.

Head, tawny-reddish; face and the clothed base of the haustellum pale cinereous.

Thorax, tawny-reddish, mixed with fuscous.

Fore-wings, tawny-red, speckled with blackish and pale cinereous scales; the costal portion of the wing above the cell from the base to beyond the middle is of a paler tawny-red than the remainder of the wing surface, and is mottled with fuscous along the costa; before the middle are two small spots of raised fuscous scales, nearer to the costal than to the dorsal margin, the lower one being farther from the base than the upper and immediately followed by a streak of pale cinereous scales; some bright reddish scales lie between the two discal spots and on and about the fold; slightly beyond the middle is a conspicuous, roundish, pale cinereous spot, above and beyond which is a profuse sprinkling of pale cinereous, mingled with blackish-fuscous scales reaching to the costal margin but not to the apex; at the base of the dorsal margin is a small patch of pale cinereous the outer edge of which is straight; cilia greyish, sprinkled with reddish.

Hind-wings, pale cinereous.

Abdomen, pale cinereous with a slight ochreous tinge.

Legs, hind tibiæ mottled with grayish.

Exp. al., 23mm

Habitat, Orono, Me.; Wisconsin.

Types, ♂ ♀, *Mus. Wlsm.*

I have received this species from Wisconsin, from the late H. K. Morrison, and also from Maine, from Professor Fernald, who was at one time disposed to regard it as *hilarella Z.*, from which, however, it is totally distinct. The species appears to be not very far remote from *hypericella*, but it is somewhat larger and paler.

I believe that the description of the supposed larva of *hilarella* (Coquillett, Pap. III, 98) really refers to this species, inasmuch as Fernald had sent specimens of this insect to several correspondents, myself among the number, under the name of Zeller's species, and had not the Zeller collection subsequently come into my possession I should probably have failed to recognize the mistake.

Depressaria parilella Tr., var. novo-mundi Wlsm.

In the P. Z. S. for 1881, pp. 317–18, I discussed the question of the identity of the North American *Depressaria*, for which I suggested the name *novo-mundi*, with *D. parilella* Tr., a well-known European form.

After re-examining a full series of specimens from both continents, I am not prepared to argue that those from Oregon or from the Eastern States should be regarded as anything more than local forms of *parilella*, especially as Zeller (Lin. Ent., IX, 283 *et seq.*) describes no less than five different varieties of the species known in Europe. The only points in which the American specimens differ from those in the Zeller collection are in the slight dusting of fuscous scales around the apical joint of the palpi and in the somewhat more elongate appearance of the fore-wings as well as in their darker color. This species should therefore be referred to as *D. parilella* Tr., var. *novo-mundi* Wlsm.

I am able to add another species to the record of European forms occurring on the west coast of North America. I have received from Mr. Walker three specimens undoubtedly referable to *D. ciniflonella* Z. These were beaten out of fir October, 1882,

at Esquimalt, Vancouver Island, and were probably specimens that were commencing to hibernate.

Depressaria lythrella sp. n.

Palpi, cinereous, dotted and mottled with purplish-fuscous scales, especially towards the apex of the second and third joints.

Antennæ, annulated widely with tawny, narrowly with fuscous scales.

Head and thorax, cinereous; the former striped along the middle; the latter speckled with purplish-fuscous.

Fore-wings, tawny-reddish, much dusted with fuscous and pale cinereous towards the costa; a pale cinereous basal-patch has a distinct spot on its lower half; before the middle of the wing is a conspicuous curved black spot, edged with reddish and followed by cinereous scales; a few cinereous scales are scattered across the wing on the outer third, parallel with the apical margin, along which runs a slender line of blackish scales; cilia purplish-gray.

Hind-wings and cilia, brownish-gray.

Abdomen, purplish-gray.

Posterior tibiæ of the same color as the hind-wings; tarsi, mottled with darker scales.

Exp. al., 15^{mm}.

Larva on *Lythrum alatum.*

Habitat, Illinois;- received from Professor Forbes.

Appears to be allied to *impurella* Tr. and to the same group as *purpurea* Hw.

Depressaria gracilis sp. n.

Antennæ, brown.

Palpi, straw-colored, tinged externally on the second joint with brown, especially at its apex.

Head, pale reddish-brown; face, whitish-ochreous.

Thorax, reddish-brown.

Fore-wings, rather narrow, pale straw-color, with a short, dark brown basal patch, commencing on the costa but not reaching quite to the abdominal margin; two minute dots of brown scales on the disc before the middle, the upper one being nearer to the base than the lower; a small brown spot on the middle of the wing at the end of the cell, and a row of brown marginal spots almost connected, so as to form a marginal line, four on the apical and two on the costal margin; cilia whitish straw-color, tipped with brownish and having a strong line of brownish scales along their base; about the anal angle the cilia are paler than above it.

Hind-wings, very pale fawn-gray; cilia straw-white.

Abdomen, grayish.

Legs, pale straw-color, tinged with brown on the posterior tarsal joints.

Exp. al., 15^{mm}.

Habitat, Texas.

Type, ♂, *Mus. Wlsm.*

A single specimen received many years ago from Belfrage. It seems remarkable that this species should not have been known to Zeller or Clemens, who were both acquainted with the results of Belfrage's collecting. I have not been able to find any description of it, but if Chambers has by error placed it in the genus *Gelechia* it is yet possible that I may have overlooked it. It is a small and rather slender species with normal neuration, closely allied to the European *D. culcitella* HS.

PLUTELLA Schrk.

Plutella omissa sp. n.

Head, face, and antennæ, white; palpi slightly tinged with brownish at the sides.
Fore-wings, white, with a yellowish tinge, most noticeable along the fold, sometimes with a very few scattered brownish scales; the dorsal and apical margins and the anal angle are dotted with small groups of brown scales; cilia white.
Hind-wings, very pale grayish, iridescent, with a rosy hue; cilia paler.
Exp. al., 13^{mm}.
Habitat, Willow Creek, Oregon, September 9, 1871. Five specimens.
Type, ♂ ♀, *Mus. Wlsm.*

(*To be continued.*)

GENERAL NOTES.

NOTES ON THE COCHINEAL INSECT.

In October, 1886, we received from Mr. A. F. Carothers, Iuka Ranch, near Cotulla, La Salle County, Tex., a large number of specimens of the Cochineal Insect (*Coccus cacti*), and were much interested to find that they were being destroyed by a predaceous caterpillar, which worked in precisely the same way as *Dakruma coccidivora* upon the Cottony Maple scale, described by Professor Comstock in the annual report of this Department for 1879. The caterpillars ate one Coccid after another, spinning a silken tube as they progressed and remained hidden inside the tube, which was covered with fragments of the Coccus and of its white secretion. We were fortunately able to rear the adult, which proved to be beyond question identical with *Dakruma coccidivora*, this species having previously been found only in the District of Columbia.

Another enemy of the Cochineal Insect was reared from this same lot of specimens. This is a true parasitic fly of the genus *Leucopis*, species of which have previously been recorded as attacking scale insects. Specimens were sent to Dr. Williston who has kindly sent us the following description, as the species proves to be new:

Leucopis bellula, n. sp., Williston

Length 1¾–2^{mm}. Black, thickly grayish white dusted. Front with two slender, gently arcuate, black stripes; the narrow orbital space perceptibly more whitish. Antennæ black, the basal joints shimmering whitish; arista short. Face in color like the frontal orbits. Mesonotum with two conspicuous chocolate-brown stripes, beginning on the inner side of each humerus and gently converging to the posterior margin. In the middle of the dorsum, before the scutellum, there are two bristles; the usual bristles on the lateral margin, and on the margin of the scutellum; none on the front or vertex. Abdomen more whitish than the thorax; clothed with short black hairs; first segment with the lateral margins and a posterior band, deep brown; second third and fourth segments each with a slender, sub-interrupted stripe and a pair of rounded spots, all deep brown in color; the pair on the second mod-

erately large, on the third, smaller, and on the fourth, punctiform or minute. Legs black, with the same whitish pruinosity; the immediate tip of femora, the base of front and hind tibiæ, the middle tibiæ, and the tarsi, except their tip, yellow, the tibiæ elsewhere and the tip of the tarsi brown or infuscated; in some specimens, the tibiæ throughout are more brown. Wings hyaline, or faintly clouded; the auxiliary vein distinctly separated from the first longitudinal, except at tip; the last section of the fifth vein a little shorter than the penultimate one of the fourth.

Four specimens, from Professor Riley, labeled "Par. on *Coccus cacti.*"

I was, at first, in doubt as to the specific difference of this from *L. bella* Loew, from Cuba. Aside, however, from the different habitat, there are sufficient differences in coloration to indicate a well-marked variety, at all events. Loew describes his species as having "Antennae nigrae, albido-pollinosae," the second segment of the abdomen only, as bearing a "maculam rotundam atram," and "Alae lacteae" in color.

A species of Drosophila was also bred from the mass of Coccids, and this Dr. Williston determines as *Drosophila quinaria* Loew. This insect, however, is of course not a parasite.

We notice from the *Florida Dispatch* of August 6, 1888, that the Cochineal Insect has become very abundant upon Opuntias at Jessamine, Pasco County, Fla., on the authority of a communication from Walter N. Pike, of that place. The specimens were determined by Mr. Ashmead. The only previous record of the occurrence of this dye insect in Florida is that by Professor Comstock upon page 347 of the annual report of this Department for 1880. Professor Comstock's specimens were collected by Dr. R. S. Turner at Fort George, Fla., upon a yellow-flowering cactus, the species of which was not determined.

THE BEET CARRION-BEETLE.

A notice in the American Agriculturist for September, 1888, to the effect that the Beet Carrion-beetle (*Silpha opaca*) has been doing a great deal of damage to mangolds in England the past season, reminds us of the fact, to which attention has not lately been called, that this insect is also found commonly in this country, but that it has never here, so far as records go, been reported as injurious. Like other species of its family it feeds upon decaying animal and vegetable material. In England, however, it occasionally does great damage to the mangel-wurzel crop. It was first noticed to have this habit in 1844. The damage is done by the larva feeding upon the leaves.

AN AFRICAN LADY-BIRD INTRODUCED INTO NEW ZEALAND.

Through the kindness of Mr. Henry D. Twohy, of Auckland, we were some time ago favored with the following communication from the *Otago Witness* of February 3, 1888, which, through an oversight, had not been published. Mr. Twohy suggests that, if it seemed desirable, the same lady-birds could be shipped from Cape Town and landed in New York by way of London in twenty-six days, if the boats made close connection. Our Australian importations, however, are so promising at present that this experiment is hardly worth trying:

An interesting experiment is being conducted at Nelson in the way of acclimatization. It appears that some of the finest trees in and about Nelson have been de-

stroyed by the Wabble Blight or Australian Bug. Mr. Tinline, while at Cape Town, read there a pamphlet by Miss Ormerod, the entomologist, entitled "Notes on the Australian Bug (*I. purchasi*) in South Africa," which stated that the grubs of a coccinellid or lady-bird have been observed by Mr. Bairstow to do much good, by destroying the young Australian bugs just at hatching time within the sac of the female. Of these Mr. Bairstow says:

"The Coccinella is by far our best friend. It is proving a perfect godsend in destroying the perfect young *in nidus* of the female 'bug.' The larva buries itself in the gravid female and completely destroys her progeny, the dead carcass falling to the ground; and it eats the 'bug,' not only when it (the Coccinella) is young, but when it has developed to beetle condition." Mr. Tinline accordingly wrote to a friend in Cape Town asking him to procure some of the lady-birds, which he did, and one hundred and twenty of the little beetles were caught, put into a bottle with a good supply of the "bugs" to feed upon, and shipped on board of the *Tongariro*. On arrival in New Zealand (passage twenty to twenty-two days, steamer) it was found that by far the larger number of them were alive and healthy. A few were given to Mr. Maskell in Wellington, and the remainder brought on to Nelson. Mr. Maskell's advice was to select some small shrub infested with the blight, cover it carefully with muslin, and then turn the lady-birds into this cage. A young lemon tree, to which the bug is paying great attention, was selected in Mr. Sharp's garden for the purpose, and there the little colony of lady-birds is to all appearances thriving.

SUCCESSFUL SPRAYING WITH PARIS GREEN FOR CODLING MOTH.

Through the kindness of Mr. G. F. Kennan, of Rogers, Benton County, Ark., we learn that at the county fair, held from the 10th to the 13th of October, 1888, Mr. Ellis, of Bentonville, sent in the entire product, good and bad, of two Ben Davis apple trees, which he had treated with Paris green, and asked that they be examined by experts. This was done, and the investigation proved that not a single apple infested by Codling Moth could be found.

THE LEATHER BEETLE LITIGATION.

Those who read the article on the Leather Beetle or Toothed Dermestes (*Dermestes vulpinus* Fab.) in our Annual Report for 1886 (pages 258 to 264) will be interested, doubtless, to learn that the lawsuit between A. Einstein's Sons, of Savannah, and the Boston and Savannah Steam-ship Company, in which the former claimed damages for injury done by this beetle to boots, as alleged, from Boston to Savannah, has since been tried twice, and that both times the juries have failed to agree. The issue is still being fought, and it is not outside the bounds of possibility that some day a decision may be reached. The evidence at the final trial will be interesting reading to entomologists.

PERSONNEL OF THOSE ENGAGED IN GOVERNMENT ENTOMOLOGICAL WORK.

The following list embraces those now engaged in Government entomological work, and who will assist in the management of the periodical; those at Washington editorially, and the others as contributors. The force of the Division of Entomology is more or less inconstant, as it consists of both permanent and temporary employés:

DIVISION OF ENTOMOLOGY, U. S. DEPARTMENT OF AGRICULTURE.

Entomologist: C. V. Riley.

Office Staff: L. O. Howard, First Assistant; E. A. Schwarz, Th. Pergande, Tylor Townsend, C. L. Marlatt, Assistants; Philip Walker, Assistant in silk-culture and in charge of reeling experiments.

Field Agents: Saml. Henshaw, Boston, Mass.; F. M. Webster, La Fayette, Ind.; Herbert Osborn, Ames, Iowa; N. W. McLain, Hinsdale, Ill.; Mary E. Murtfeldt, Kirkwood, Mo.; Lawrence Bruner, Lincoln, Nebr.; D. W. Coquillett, Los Angeles, Cal.; Albert Koebele, Alameda, Cal.

DEPARTMENT OF INSECTS, U. S. NATIONAL MUSEUM.

Honorary Curator: C. V. Riley.

Assistant Curator: John B. Smith.

☞ For bibliographical purposes it may be necessary to state that, where expedient, the names or initials of members of the force will be attached to their communications. Where initials alone are appended, the full name can be ascertained by referring to the list above given.

Editorial or unsigned articles or notes should be credited to "INSECT LIFE," or where it is desired to give personal credit, to "Riley and Howard." While most of the correspondence of the Division is carried on by myself yet much of it is also attended to by my first assistant, Mr. Howard, who acts as Entomologist in charge during my absence, and otherwise so materially assists in editorial and office work that only those articles signed by either should be considered individual. Illustrations, where not otherwise stated, are drawn by Miss Lillie Sullivan, under supervision.—C. V. R.

U. S. DEPARTMENT OF AGRICULTURE.

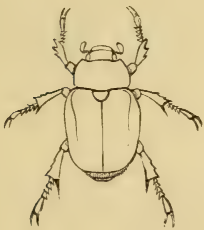
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. MARCH, 1889.

Vol. I. No. 9.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS.



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SPECIAL NOTES.

Poisonous Bites.—We would call especial attention to the long and interesting letter from Dr. E. R. Corson on spider bites, which we publish on page 280, and which is an important contribution to the discussion of the subject. Dr. Corson is an old acquaintance and a former collector of insects. He is a most reliable observer. We hope that our article in the January number will reach the eyes of other physicians, who will be able to add similar cases from their own practice. We also publish a letter from Mr. E. W. Allis bearing upon the same article, and may state in this connection that the views which he presents are practically those suggested by us in our article upon poisonous insects, published in Volume V of the Reference Handbook of the Medical Sciences (Philadelphia, 1887). We have stated upon page 741 of that volume that the effects of insect poisons depend in great measure upon the idiosyncracy of the individual and upon the state of health and constitution.

Cranberry Fungus Gall.—We also publish, under the head of "General Notes," an interesting communication from Dr. Fr. Thomas, of Ohrdruff, Germany, relative to the Cranberry Gall mentioned upon page 112 of the current volume of INSECT LIFE. Specimens of this gall were sent to Dr. Thomas, and his remarks are authoritative. The determination of the gall as of Phytoptus origin was made by our assistants during our absence in Europe, and while we should have been more cautious had we seen the specimens, the error is a very pardonable one, as the resemblance to many other Phytoptus galls is striking. This is one of the few instances where a fungus has been mistaken for insect work, while our mycological friends have often been caught napping in mistaking and even describing as of fungus origin structures due to insects.

The secondary Icerya Parasite.—At the time of our last writing we were in some little doubt as to whether the supposed secondary parasite of Icerya might not prove to be a primary parasite, or at all events a parasite upon something else than the very useful Lestophonus. But recent communications from Mr. Coquillett have deprived us of this hope. He writes under date of January 15: "I have just examined a number of puparia of the Lestophonus, and in two of them I found two of the Chalcids, one in each puparium. In one the Chalcid was dead, but the other was living, and I found it in a puparium that was entire, not having a hole in it by which the Chalcid entered; so there can be no doubt of the Chalcid having been developed in the inside of this puparium.' As yet none of these secondary parasites have been allowed to escape, and it is quite possible that by the great care which is being taken the Lestophonus may be introduced without its destructive enemy.

National Organization of Entomologists.—Our proposition in the January number of INSECT LIFE concerning the formation of a national organization of economic entomologists, however favorably the idea may have been received, has not resulted in many expressions of opinion so far.

Prof. A. J. Cook, of the Michigan Agricultural College, writes:

> Your suggestion of annual meetings where entomologists may discuss insects and especially methods of work is most timely, and I hope will result in the organization. I should give any such project my hearty support.

Prof. Herbert Osborn, of the Agricultural College at Ames, Iowa, writes:

> Your suggestion regarding the national society of entomologists seems to me very timely. Only a few days ago the same subject was in my mind, and I believe an American Society for entomologists or an Entomologists' Union, on the basis of the Ornithologists' Union, or something similar, would be very advantageous to the cause of entomology.

A few other gentlemen have written in much the same terms, and we shall be glad to get not only such general opinions, but also definite suggestions.

We notice that several of the editorial or unsigned articles in INSECT LIFE have been copied by other journals with individual credit, and we would therefore call particular attention to the notice which is always published upon the third page of the cover, to the effect that all editorial or unsigned articles, when personal credit is desired, should be attributed to the joint work of "Riley and Howard."

We are pleased to learn that through the liberality of Senator McMillan, of Michigan, the Michigan Agricultural College has been able to purchase the Fred Tepper collection of Lepidoptera.

INSECTICIDE APPLIANCES.

By C. V. Riley.

[*Continued from p. 249.*]

FOREIGN MODIFICATION OF THE RILEY NOZZLE (Continued).

The Vermorel Nozzle.—Another and perhaps the most important modification of the Riley nozzle is that of V. Vermorel, Villefranche (Rhône), France. It is well shown both entire and in section at fig. 58.

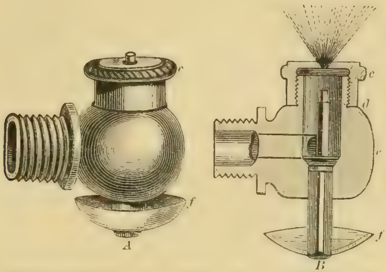

Fig. 58.—The Vermorel Nozzle—natural size (Original).

The important part of this nozzle is the disgorger, an attachment for removing obstructions from the discharge orifice. This is accomplished by perforating the bottom of the cylindrical chamber with a circular opening about half the diameter of the chamber. Into this is inserted from above a rod, which is circular terminally but preferably triangular below and fitting loosely in the orifice. This rod projects below the chamber so as to give movement enough to permit its distal end to be thrust through the opening in the removable cap, *c*. The part of the rod within the chamber consists of a seat which is ground to fit the bottom of the chamber when the rod is forced down by the water in action, as shown in the section, *B*, thus preventing the escape of liquid, an object which is further assured by fitting a rubber casket, *e*, on the lower surface of the seat. Above the seat the rod is cylindrical and of considerable size until near the end, *d*, where it is dressed to a diameter small enough to pass through the discharge orifice. The dimensions of the different parts of this rod must be governed by the size of the parts of the chamber.

When the discharge becomes obstructed the rod is pressed forward until the small end shown at *d* forces out the obstruction. The pressure once removed the rod falls back to its place. While the rod is pressed forward the water rushes out around it through the lower part of the chamber, thus completely washing out sediment of any kind. To prevent this outflow at the base of the chamber from falling upon the

operator a shallow concave cup, *f*, is fastened with a screw to the lower end of the rod. This deflects and throws the liquid forward. This device was added to the nozzle by Prof. F. L. Scribner, formerly Mycologist of this Department, and is an important addition, especially when spraying overhead.

This nozzle accomplishes the desired work equally as well as those without the disgorging or cleansing attachment, and the disgorger is a great convenience when spraying with solutions which are not clear. This is one of the most satisfactory nozzles for spraying lime solutions. The diameter of the discharge orifice is made much larger for using lime-water and the heavy suspension liquids which are used as fungicides than is necessary for ordinary insecticide preparations. If the orifice is too large the liquid passes out in a thin cone-shaped sheet and is not broken into fine spray.

As will be seen from the illustration, this nozzle can be screwed into the coupling at the end of the discharge pipe and used as a side discharge nozzle, or by using an elbow coupling the discharge may be direct from the distal end.

Recently M. Vermorel has altered the construction of this nozzle so as to make the eddy chamber adjustable on the stem, thus permitting the spray to be directed at any desired point within the circumference of a circle. Fig. 59 will help to illustrate how this is accomplished. This style is made in singles and doublets. The illustration gives the doublet. The chambers, *a* and *a′*, on either side are fitted into the stem *c* by short smooth nipples, *b* and *b′*, projecting out from the body of the chambers. They closely fit the circular opening through the head of the stem *c*, but permit the chambers to freely rotate around the axis of a line drawn through their base. From the center of the nipple of the chamber *a* a brass rod extends through the head of the stem *c* and through the base of the chamber *a′*, below the eddy chamber, and enters the thumb screw, *f*. By loosening this thumb-screw the nozzles can be freely rotated and by tightening it it is firmly held in place at whatever angle desired.

In the cut the parts of the nozzle are shown separated, yet in a line occupying their relative positions in the perfect nozzle. Mounted in

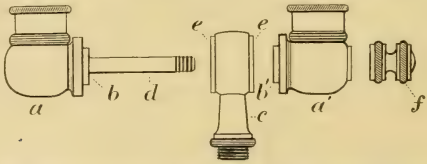

FIG. 59.—Improved Vermorel Nozzle—reduced about one-half (Original).

this manner only the chamber *a* can be fitted with a disgorger, as the rod which binds the chambers together would necessarily interfere with putting one into the chamber, *a′*.

The tangential entrance to the eddy-chamber is made from the face of the nipples, *b* and *b′*, and as these do not meet in the stem, rotating the chambers does not interfere with the flow of the liquid. This is a useful modification in the construction of this nozzle both from the fact that two nozzles are conveniently mounted on one discharge pipe, and that, being fitted on a rotating axis, the direction of the spray can be governed at will.

The Albrand Modification.—Mr. G. Albrand has constructed a Riley nozzle on the same principle as his modification of the Raveneau nozzle. Not satisfied with the Vermorel system of disgorging or clearing the nozzle from obstructions, he has constructed his with the cap attached to a thumb-lever held in place by a spring.

When the discharge orifice, which is situated in the removable cap, becomes obstructed, a pressure on the thumb-lever raises the cap and permits the liquid to rush out, carrying away any obstructions.

The cut (Fig. 60) illustrates this feature of the nozzle. The eddy-chamber is situated at the extremity of the stem, *b*; *c* is the cap and *a* the thumb-lever held in place by the spring beneath it.

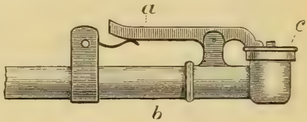

Fig. 60.—The Albrand Nozzle—reduced (Original).

The Japy Modification.—In this nozzle Japy has devised a degorger somewhat on the principle of the Vermorel, but which works in the opposite way (Fig. 61). In normal position the thumb-lever *a* is sufficiently raised by the spring placed between it and the tube *b* to throw the needle *c* down into the discharge orifice, thus closing it and preventing the passage of the liquid.

When the operator wishes to begin work he presses upon the lever as shown in the cut and immediately the spray issues from the eddy-chamber. If the discharge becomes clogged he releases the lever and the needle is thrown forward into the opening, thus clearing it. This is a convenient and simple plan of disgorging, and at the same time serves the purpose of a stop-cock or cut-off.

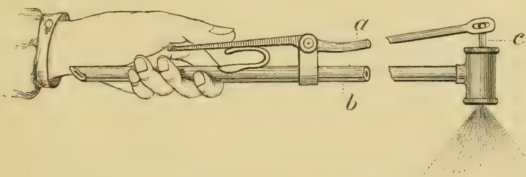

Fig. 61 —The Japy Nozzle—reduced (Original).

By reference to Fig. 61 the plan of the nozzle will be easily understood. In general construction it does not differ from other nozzles of

the eddy-chamber class, the details of which are fully given in other drawings.

The Marseilles Modification.—This novel modification of the Riley nozzle was recently brought out by a society known as the Future of Viticulture (l'Avenir Viticole) of Marseilles, France, and deserves attention as the most radical modification which has yet come into our possession as well as for its utility. In this the typical chamber has been so altered as to bear little resemblance to the original type. This is fully shown in the illustration (Fig. 62). The stem, *f*, is a brass tube which makes a screw connection with the discharge pipe at its proximal end, and has its distal end closed by a cap soldered on and bearing in its center the disgorging needle, *d*. Just below the closed end an orifice, *c*, communicates with the interior. This is cut tangentially in the side wall of the tube and is of considerable size. It is covered externally by a thin brass band fitted closely over the tube, but which does not quite complete the circumference. This is indicated in the drawing. This band can be adjusted about the tube so as to leave a greater or less opening at *c* as may be desired. When turned partially over the orifice, *c*, it reduces the opening to required dimensions and forces the issuing liquid to take a rotary motion about the stem, *f*, and to rise with such motion into the chamber shown immediately above. Below the band just mentioned is a thicker band, *g*, soldered around the tube. The lower edge of this forms a shoulder which meets the inward turned shoulder, *h*, of the outer jacket, and a rubber washer between completes the joint. The outer jacket extends beyond the end of the inner tube and forms a chamber covered by the removable screw-cap, *a*, which is pierced in the center with the discharge orifice *e*. The illustration shows one half of the outer jacket cut away. It slides readily upon the stem, *f*, so that to remove an obstruction the outer jacket only has to be drawn bodily downward when the needle, *d*, enters and clears the orifice. I have as yet had no opportunity to use this nozzle, but believe that a cord or wire can readily be used to draw the outer jacket down when it is out of reach of the hand. The pressure of the liquid immediately restores it to the normal position.

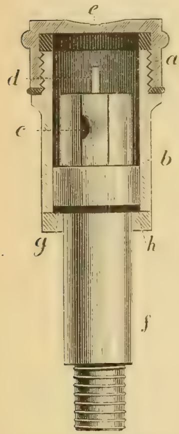

FIG. 62.—Construction of the Marseilles Nozzle—natural size (Original).

The New Zealand Triplet Modification.—The triplet cyclone manufactured by Kutzner Bros. of Masterton, New Zealand, is one of the practical foreign modifications of the Riley nozzle worthy of mention and illustration. The history of the introduction of the eddy-chamber system of nozzles into Australia and neighboring islands is told by Mr. Frazer S. Crawford of Adelaide, South Australia, in his paper treating of the Fusicladiums.

Mr. Crawford first learned of this system of nozzles though Mr. Hubbard's Report on Insects Affecting the Orange, sent him from the Department of Agriculture. He had several made which he used successfully in his orchards and gardens, but desiring a larger amount of spray than one nozzle furnished he combined them in doublets and triplets as desired, by branching the discharge pipe near the end and attaching a nozzle to each branch and holding all together by means of a clamp. This idea led to the development of the triplet shown in the cut, and is more fully set forth in the communication with which I will close this second paper.

When it came to the knowledge of the Division that the eddy-chamber system of nozzles was being successfully used in Australia, an order for specimen nozzles was sent to the makers above mentioned, as also the request that they furnish information about its introduction there, and the adoption of the peculiar form of triplet manufactured by them. This letter being published in a New Zealand paper, called forth the following response from Mr. Crawford, through which we learned the details of its introduction and development in that part of the world. That portion of the letter which relates to the matter under consideration is here given, as it is of considerable interest:

SURVEYOR-GENERAL'S OFFICE,
South Australia, *June* 11, 1888.

DEAR SIR:

* * * * * * *

(4) *Regarding the Riley Cyclone-nozzle.* By a New Zealand paper I perceive that you have ordered from Messrs. Kutzner Bros. of that colony a triplet cyclone-nozzle, as you are about to issue a bulletin on that very useful nozzle. The early history of the cyclone-nozzle in Australia you will find in my report on the Fusiciadiums, etc. The original triplet as figured, being the first made in the Australian colonies, is the one I still use in my garden. This I lent to Mr. Dobbie of Gawler Place, Adelaide, who undertook to manufacture them on his own account, and he improved on mine by fixing the three nozzles to a central chamber, the top of which unscrews. These have been sold in New Zealand, Victoria, Tasmania, and New South Wales, one being purchased by Kutzner Bros., who wrote to me about it. * * * I regret to say that an enterprising Californian, a William Spawn, has been allowed to patent it in South Australia, although his patent is not worth anything because mine was made and publicly exhibited before he applied for the patent. He has also patented it in Victoria. The drawing accompanying his specifications was simply an enlargement of the drawing of the nozzle as figured in one of your reports.

I consider the cyclone type of nozzle as the greatest boon that orchardists have received, as without it it is quite impossible to spray a large orchard satisfactorily.

* * * * * * *

Yours, very faithfully,

FRAZER S. CRAWFORD.

Professor RILEY.

The arrangement of the triplet cyclone received from Messrs. Kutzner Bros. is shown in the following illustration (Fig. 63). The nipple, which is designed to enter five sixteenths inch hose, is surmounted by a hemispherical chamber, *b*, which is covered with a milled-edge cap, *a*, which screws into the chamber, *b*. On this cap are mounted at the angles of of a triangle three Riley nozzles. The one to the rear stands higher than the others and delivers its spray straight in front, while the lower ones are respectively freed slightly to the right and left of a direct line. This arrangement secures a broad diverging cloud of spray and very much facilitates the work without in any way detracting from the quality of the spray as is the case when an attempt is made to increase the capacity by enlarging a single nozzle. A disgorger could be easily added to the chambers as here arranged, but as yet we believe no attempt has been made to do so. A screen of fine wire cloth is placed across the hemispherical chamber, thus rendering clogging almost impossible.

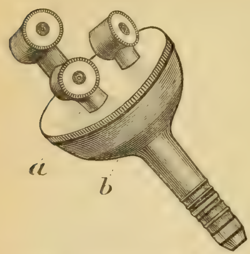

FIG. 63.—The New Zealand Triplet—reduced (Original).

THREE NEW PARASITES OF ICERYA.

BY L. O. HOWARD.

Professor Riley has turned over to me for description three of the parasites reared by Mr. Coquillett, at Los Angeles, from the Fluted Scale (*Icerya purchasi*). These he has referred to by name in his annual report for 1888, and the accompanying figures are from the report. The necessity for condensation, however, rendered it desirable that this descriptive matter should be published elsewhere. Neither of the three species seems to be at all abundant.

THORON OPACUS, sp. nov.

Male.—Length, 0.84^{mm}; expanse, 1.2^{mm}; greatest width of fore wing, 0.163^{mm}; length of antenna, 0.6^{mm}. Joint 1 of funicle rather shorter and slightly narrower than pedicel; funicle joints distinctly separated, subequal in length, increasing very slightly in width from 4 to 9, joints 2 and 3 equal in width and slightly slenderer than either 1 or 4; club one-third longer than joint 9 of funicle, ovate, at base of same width as joint 9 of funicle, without a trace of dividing sutures. Metanotal spiracles large, oval; metascutellum with a straight median longitudinal furrow. Abdomen flattened, ovate, rather longer than thorax. General surface of the body with no visible punctation, opaque. Head, antennæ and thorax dark brown; abdomen rather lighter; all legs brown; tarsi nearly white; base of all tibiæ nearly white. Wings hyaline; veins slightly dusky.

Described from 1 ♂ specimen, rather poorly mounted in balsam, reared by D. W.

Coquillett, at Los Angeles, Cal., July 21, 1887, from adult female of *Icerya purchasi*. It was reared in a box containing only three or four of the scales, so there can be lit-

Fig. 64.—*Thoron opacus*, Howard: *a*, antenna; *b*, *c*, *d*, fore, middle, and hind legs; *e*, last tibial and first tarsal joints of fore leg; *f*, abdomen; *g*, wings; *h*, hooks of hind wing—all much enlarged (Original).

tle doubt of its having lived at the expense of one of them. Mr. Coquillett reared another specimen August 29, 1887, but this I have not seen.

COCCOPHAGUS CALIFORNICUS, sp. nov.

Female.—Length, 1.4^{mm}; expanse, 2.1^{mm}; greatest width of fore wing, 0.39^{mm}. Abdomen broader than thorax and one-third longer. Pedicel and joints 2 and 3 of funicle subequal in length; joint 1 of funicle one-third longer. Eyes rather more plainly hairy than usual. General color dark brown, nearly black, no punctation visible. Mesoscutellum lighter in color than rest of thorax except at immediate base, its posterior edge with a narrow band of bright lemon-yellow, extending from one lateral angle around the curved border to the opposite lateral angle, of nearly equal width throughout, at its widest portion measuring .027^{mm}; all coxæ brown; all trochanters yellowish-white; all femora brown, yellow at tip, more yellow at tip of front femora, less at tip of middle, and still less at tip of posterior femora; front tibiæ light yellow, very slightly dusky; middle tibiæ entirely light yellow; hind tibiæ yellowish with a brownish shade near base; all tarsi yellowish-white, last joint

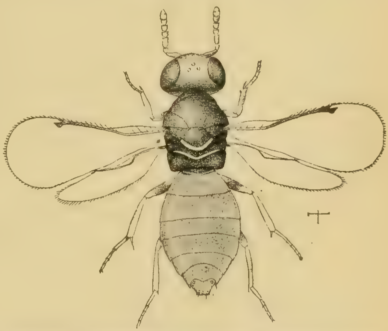

Fig. 65.—*Coccophagus californicus*, Howard—enlarged (Original).

dusky. Wings hyaline, veins light brown, distinct. Described from one female specimen reared from a female *Icerya purchasi* at Los Angeles, Cal., July 6, 1887, by Mr. D. W. Coquillett.

FIG. 66.—*Encyrtus dubius*, Howard—enlarged (Original).

ENCYRTUS DUBIUS, sp. nov.

Male.—Length, 1.2^{mm}; expanse, 2.2^{mm}; greatest width of fore wing, 0.37^{mm}. Scape of antennæ long, thin, cylindrical, together with bulla as long as first three funicle joints; pedicel short, conical; joint 1 of funicle longer than pedicel; joint 2 slightly shorter than joint 1; joints 2 to 6 subequal in length and width, each constricted at either extremity; club ovate, one-third longer than joint 6 of funicle, but not exceeding this in width; funicle and club with hairs at least as long as the joints themselves, but not arranged in regular whorls. Marginal vein of fore wings lacking; postmarginal equal in length to stigmal. Head, mesoscutum, and scapulæ very delicately shagreened; mesoscutellum with regular fine longitudinal ridges. Metanotal spiracles circular. Abdomen ovate, slightly longer than thorax, and equal to it in width. General color, brown, glistening; head and mesonotum with greenish metallic luster; antennæ and legs light brown, base of tibiæ whitish. Wings hyaline, veins brown.

Described from one ♂ reared from *Icerya purchasi* at Los Angeles, Cal., September 3, 1887, by D. W. Coquillett, issuing in a box which contained only adult females of the scale.

Differs in antennæ and sculpture of scutellum from any ♂ Encyrtus which I have seen. As the ♀ has not been reared, this may prove to belong to some allied genus, hence the specific name.

A CONTRIBUTION TO THE HISTORY OF THEOPHILA MANDARINA.

BY PHILIP WALKER.

Desiring about two years ago to obtain some information about the wild mulberry-feeding silk-worm of China, the *Theophila mandarina*, which had excited some attention in Europe, the Commissioner of Agriculture requested the Secretary of State to instruct the consul-general of the United States at Shanghai to examine into the matter and obtain sam-

ples of the cocoons and manufactured products, and if possible some of the eggs. In this the consul-general was successful, as the following correspondence shows.

The eggs were duly received at the Department, but failed to hatch. This is, we believe, the experience of European experimenters. The object of this importation was to obtain a vigorous race of mulberry-feeding worms, which might be interbred with our own depleted races and instil into them new life. The outcome was unfortunately unsuccessful.

UNITED STATES CONSULATE-GENERAL,
Shanghai, August 9, 1886.

SIR: Referring to the Department's instructions No. 7, inclosing a copy of a communication from the Commissioner of Agriculture to Mr. Bayard, relative to a certain race of silk-worms named therein, I have the honor to state that Shang-lin, a district in which a kind of wild worm makes its cocoon on the ordinary mulberry tree, is some 120 miles northwest of Shanghai, and to get there a long and, at this season of the year, tedious journey is necessary.

I have been informed that the gathering of this wild cocoon is carried on from the end of the sixth month to the beginning of the eighth (Chinese calendar), and it being now the middle of the seventh month, I have thought it advisable to instruct Mr. Emens, the interpreter of this consulate-general, to visit the district of Shang-lin as soon as possible and inform me of the result of his inquiries and procure the samples desired by the Commissioner of Agriculture.

The obstacles which will present themselves in making the inquiries in this matter will be increased if they are not made during the season, which will close two weeks hence.

It may be of interest to the Commissioner of Agriculture to know that this particular kind of cocoon, very little known to Chinese and still less by Americans and Europeans, is supposed to be a degenerate form of the ordinary silk-worm. Twenty to twenty-five years ago, when this section of China was devastated by rebels, the people of Shang-lin were compelled to flee from their homes at the season of the year when they were engaged in breeding their silk-worms. Being thus suddenly deprived of any care whatever the butterflies laid their eggs promiscuously, and in time this peculiar race of worms has developed, and it is said they are not to be found elsewhere in China.

The silk is of lighter weight than the ordinary product, and it may possess ordinary properties that Americans may develop to their profit.

I do not think it has received the attention of European cultivators of the silk-worm.

I have the honor to be, sir, your obedient servant,

J. D. KENNEDY,
Consul-General.

HON. JAMES D. PORTER,
Assistant Secretary of State, Washington. D. C.

SHANGHAI, *August* 27, 1886.

SIR: In conformity with your verbal instructions to obtain for the United States Department of Agriculture a small quantity of the eggs of a race of mulberry-feeding silk-worms, scientifically known as the *Theophila mandarina*, and called by the natives Tien-seng-tsan, together with samples of the cocoons of this insect and of the silk spun from them, I have the honor to report that I left Shanghai on the 12th instant and proceeded to Shang-lin, a name applied to a village and the surrounding district situated in the northern part of Che-Kiang. It is a level, fertile region,

throughout which the mulberry is extensively cultivated. At the village of Shang-lin I could obtain no satisfactory information regarding the wild worm, as the natives termed it, and I therefore went a few miles into the country and finally reached a small village, where I saw the first crop of wild cocoons in the process of being spun.

I made inquiries respecting the eggs, but the people seemed totally ignorant of the matter, and I was repeatedly told that these worms came from heaven, which explains the term used in the letter of the Commissioner of Agriculture, Tien-seng-tsan, which, literally translated, is heaven-born silk-worm. Throughout a circuit of 20 miles this wild worm is met with. No attempt is made to propagate them. They take up their abode in the mulberry orchards from which the domestic worm is fed, and they are regarded by some of the farmers as a nuisance, while others in whose orchards they are numerous gather and dispose of the cocoons.

I could only learn of five places where the spinning of these cocoons is carried on.

I secured four samples of cloth, which I have marked Nos. 1, 2, 3, and 4. No. 1 is a crape used for women's turbans, for which I paid the retail price of 70 cents, Mexican. No. 2 is a kind of gauze, and is used in various ways; price, 40 cents. No. 3 is used for clothing; price, 52½ cents. No. 4 is made from the outside covering of the cocoon, from which a kind of down, used for wadding in quilts and winter clothing, is also made. Sample No. 5 is a lot of cocoons before being stripped, and No. 6 shows the appearance when ready for winding. Sample No. 7 shows the spun silk as taken from the reel.*

It will be observed that it is of a yellowish color and much coarser than the ordinary silk. I did not succeed in obtaining any of the eggs, the second crop being all hatched, but I made arrangements to have a quantity sent me as soon as the worms, which are now about twenty days old, have developed into moths. I expect they will arrive in Shanghai in the latter part of September. Eggs laid in the eighth moon hatch out so that the cocoons are ready to gather in the following sixth moon, forming the first crop. The second crop is gathered in the eighth, and no attention whatever is given at any time to the breeding or raising of these worms.

They must lay their eggs on the bark of the mulberry tree as well as the leaves, for in the autumn the leaves are all stripped from the trees and fed to sheep. Yet the crop is always about the same.

Attempts to cultivate them or to compel them to lay their eggs indoors will, I was informed, prove unsatisfactory. The moths will either escape or die. I was told that they never cross with the domestic worm. They feed upon the mulberry leaves exclusively. I made inquiries as to their origin, and was told that they had always existed throughout that section. Information that I had previously obtained in Shanghai to the effect that they are a degenerate type of the ordinary worm, caused by the advent of the rebels twenty-five years ago, was not corroborated by the answers to my questions on the subject. An old man of seventy, who was busy reeling silk, told me that he had known of them for over sixty years. The natives spoke of their hardiness and their indifference to rain, wind, or any of the conditions that seriously affect the domestic worm.

The majority of the natives of whom I made inquiries knew nothing of their habits. They gather the cocoons from the trees twice a year and regard them as a free gift from heaven.

I am, sir, your obedient servant,

W. S. EMENS,
Interpreter United States Consulate-General.

General J. D. KENNEDY,
Consul-General of the United States, Shanghai.

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* These samples are in the Department's silk museum.

NOTES ON THE CULTIVATION OF THE JAPANESE OAK-FEEDING SILK-WORM (Antherea yama-mai).

BY C. E. WEBSTER, M. D.

The subject of this paper is one that has engaged the attention of the writer through a period of several years, and affords many pleasant recollections.

The eggs of the Yama-mai are deposited singly or in small groups. Their tenacious brown envelope serves to fasten them to the spot when they are deposited, to occlude the minute pores which perforate the shell, thus controlling the evaporation of the contained fluids, and also as a disguise to conceal them from birds and other enemies, rendering them inconspicuous upon the rough twigs of the oak. In shape they are flattened spheroids, the greater diameter being 3^{mm} and the lesser 2^{mm}. They are deposited in the latter part of August. Those which are sterile begin to flatten out in a few days and finally collapse, while those that are fertile, if carefully opened by cutting off one face of the disk, will show the developing embryo.

The worm is fully formed long before cold weather sets in, and lies throughout the winter in a dormant state curled up within its neatly varnished case.

The eggs are commercially known as seed. I obtained my seed from Mr. W. V. Andrews, of New York, in the fall of 1872. He probably obtained the stock from England. Originally the species was brought from Japan by the French Acclimatization Society about the year 1860. The first stock was lost, and later a representative of the Dutch Government obtained a fresh supply, from which many crops were raised in different parts of Europe.

I placed the eggs in a bottle and hung them outside a north window. There they remained until the following spring. When warm weather came, fearing that they would hatch before their food-plant, the Oak, was in leaf, the bottle was lowered into a well and occasionally examined. All remained quiet until the middle of May, when there appeared three or four little caterpillars.

The Oak was not yet out. It is stated* that they will eat the leaves of the Chestnut, Quince, *Pyrus terminalis* and *P. aria* (species allied to the Mountain Ash) and also that they will eat the leaves of the Pear.†

The young worms were placed upon the pear leaves and ate vigorously, but this food brought on an attack of diarrhœa, a regular cholera infantum, from which they died, victims of circumstances and an unnatural diet. A few days later the little reddish, fuzzy oak leaves were out of bud, more caterpillars were crawling about in the bottle and the work of attending an interesting family of fifty began in good earnest.

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*Der Japanische Eichenspinner. Von Ad. Ullerich.

†In Mr. Andrews' circular.

The eggs were emptied upon a piece of moist blotting paper, covered with glass and set in a warm place. A temperature of 60° F. is sufficient to hatch them. The moisture serves to soften the shell and varnish. The worm makes a perforation in the edge of the disk, and through this opening its head can be seen vigorously gnawing at the tough rind which imprisons it. Some larvæ* make a meal of their entire egg-shell, devouring what is left of it after they emerge, but these merely eat a hole large enough to crawl through. They hatch early in the morning and have the advantage in their natural state of a drink of dew before going to the leaves. For this reason it is best to give them water before placing them upon their food, or the twigs may be sprinkled with water. They should never be touched by inexperienced fingers, but may be lifted upon a soft brush. In handling them observe the fact that their tendency is to crawl upwards.

The length of the newly hatched worm is 7^{mm}. The general color is dark, and they are quite hairy. This appearance serves a useful purpose, rendering them less conspicuous upon the twigs of the oak, and much better protected from the sharp sight of insect-eating birds than if they presented the bright green color of their later stage.

The young worms when placed upon their food at once crawl to the end of the stem and attack the leaves. In their first period they are rather restless and disposed to wander, particularly if in a light place. In four or five days they attain the length of 14^{mm}.

The caterpillar then prepares to cast its skin. For this it is necessary that it should have a firm hold upon the twig, to secure which it crawls away to the end of the stem and covers the bark for a short space with a net-work of silk. Firmly grasping this fabric with its hinder pairs of legs for two or three days, it composes itself to sleep while internal changes are taking place. During this sleep it does not assume the ordinary position of rest. The fore part of the body is elevated and very much drawn together, a position characteristic of the larva of the Sphingidæ.

Molting insects should never be disturbed. This change involves a great strength, and sickly ones are unable to endure it. Those unfortunates who enter into the new period with portions of the old skin still attached to them are quite likely to die.

The newly molted worm looks pale and delicate. Its head, much increased in size, is of a creamy color, the body of a light green and sparely covered with thin hairs. The segments do not present the plump, rounded appearance that is characteristic of the condition just before the molt, but are angular. After a short rest it repairs to the ends of the twigs where the leaves, which are now quite large and of a glossy green, serve to relieve its hunger. The chief occupation of the worms during the period between the molts is eating, and as the amount eaten

* The Sphingidæ.

depends upon the size of the jaws, we see that an occasional change is necessary to meet the requirements of an increasing appetite. When reared under cover, the leaves must be occasionally sprinkled in order to supply the worm with drink.

In a short time after the first molt it becomes somewhat darker in color and in ten days prepares, as before, for the second molt. It has then reached a length of about 26^{mm}. At the twenty-first day it makes a third cast of the skin. Its length is 45^{mm}.

Just before the fourth molt, which occurs near the thirty-first day, it measures 70^{mm}. This is its final caterpillar skin. The head which was previously more or less tinted with red remains of a permanent green. The sides are adorned with metallic silver spots, and other less conspicuous markings.

The fully grown worm forty-seven days after hatching from the egg is of a length of 90^{mm} or 100^{mm}. It is then about to produce the cocoon.

The fully grown caterpillar wanders about the branches of the Oak evacuating from its bowels, not the hard dry pieces characteristic of its ordinary condition, but a soft semi-fluid matter which will mar any cocoon upon which it happens to fall. For this reason, as well as to avoid accidents consequent upon being disturbed, the twigs containing spinning insects should be removed from the neighborhood of those preparing to spin. The worm generally selects a spot where two leaves can be drawn together to afford a partial shelter. Between these leaves it ensconces itself.

The first silk thrown out is of a golden-green color. With this is covered the stems of the leaves, the twig from which they grow, and also their proximal surfaces. This silk forms a sort of scaffolding. It prevents the leaves, and with it the web, from failing off the tree, defines the space that the cocoon is to occupy and by its color serves as a disguise for the white material that is produced later. Having inclosed itself within this coarse structure the cocoon proper is made. Along the exposed space in the opening between the leaves is woven the first thick layer of silk. The head is moved rapidly back and forth across this surface leaving after it its sticky filament. The fiber is laid in loops as if by a flourish of the pen. The entire fabric is composed of a repetition of loops like flourishes.

Each cocoon, it is stated, consists of a single thread extending from the stem through intricate weavings till it ends upon the inner surface. This thread is from 800^{m} to $1,000^{m}$ in length and $.02\frac{1}{2}^{mm}$ to $.05^{mm}$ in thickness.

In a day or two the cocoon is completed. It is a regular oval about 50^{mm} by 25^{mm}. The exposed portions of the outer surface of a golden green, while the portions protected by the leaves are of a pale green. The interior is of a silvery white.

On the third day after commencing the spinning there is evacuated a milky-white secretion, which permeates the whole structure and in dry-

ing leaves it covered with a fine white dust. This secretion is supposed to correspond to the urine of higher animals.

At this time the caterpillar skin is cast for the last time. The head splits through the middle, the split extending down the back, and by repeated vermicular movements the creature forces the skin backward until it remains a conical button packed at the bottom of the cocoon. The pupa is at first a soft sticky thing, with rudimentary members similar to those of the fully-developed moth, excepting the wings and sexual organs, which are little developed. In a short time all of these structures become agglutinated together by drying, and although their outlines are still discernible, they can no longer be separated.

The pupal period is forty days.

Let us consider the mercantile value of the structure which this insect has made for its own protection. If the cocoon be placed in hot water and stirred about, various ends of the fiber which was broken in stripping off the leaves will be found floating. If these are caught upon some rough substance and drawn out of the water, they will unravel from the cocoon and soon end. By perseverance a fiber will be found which unravels indefinitely. In the practical application of this fact for the reeling of silk several cocoons are placed in the water together and their fibers joined to form a single thread.

The peculiarities of this silk are that the fiber is strong and loosely laid, therefore comparatively easy to reel, but it is coarser than the *Bombyx mori* silk and does not take a dye readily. The silks of the various American species are somewhat finer, of various shades of brown, and difficult to reel because of the compactness of the cocoon and the delicacy of the thread. I have, however, specimens of the Cecropia silk which was of such quality that it could be manipulated.

In gathering cocoons for silk they should be taken while fresh, as soon as the worm has completed its pupal change and before the weather has affected the quality of the fiber. The pupa may be killed by steaming and drying. The cocoons can then be packed and preserved for reeling. The Japanese prepare the *yama-mai* by killing them in the sun or baking them in ovens.

The first change occurs at about the fifth week after the spinning; the chrysalis skin bursts, and the moth emerges by emptying a fluid which softens the fiber and then breaking its way through the end of the cocoon. After about an hour the wings become expanded and the perfect insect is before us. The female is slightly larger than the male and of a more somber color. The males vary in tint from dark chocolate to bright yellow, while the female varies from brown to orange. The forewings are strongly curved along the costal margin and acutely angled at the tip. Each wing presents a transparent eye-like spot, in this respect resembling the Polyphemus and Luna. The vivid coloring and strongly-marked difference between the male and female serve to distinguish this species from *A. pernyi*, its Chinese congener.

During the first day the female is quiescent. After pairing the male flies away, while the female flutters among the branches and deposits her eggs. As reared in confinement, the eggs may be gathered from the sides of the boxes within which they are deposited. The ordinary yield of a single insect is two hundred.

The *yama-mai* is a native of a hilly country, and thrives better in similar localities. The Japanese raise them either upon scrub oaks or upon cut branches of the same placed in jars of water in open sheds. If raised upon the trees, scare-crows are placed in the tops to keep away the birds and paste spread about the trunk to catch the ants.

The species can readily be cultivated in this country. The only special precaution necessary is care in the wintering of the eggs, and, if reared in confinement, the selection of a locality free from mold, cool, with a free circulation of air, and not too dry, as this is the best for the growing worms; otherwise they are liable to an infectious disease, which destroys them just before the period of spinning. It might be possible to change the habit of this species so that it could be wintered in the cocoon, but it is probable that such a change would affect the quality of the silk. It appears to me more likely that the establishment of a cultivated stock of the American species, which should winter in the egg and produce a summer cocoon, thus resembling the *yama-mai* in habit, would afford a source from which a native staple might be reeled.

I am led to this conclusion by the observation that those cocoons of the Cecropia which when reelable contained dead worms, show conclusively that change by cultivation is necessary in order to utilize the native species.

The secret of success in silk culture is in knowing the nature of the insect, and failures regarding foreign species are due to an attempt to introduce, not adopt or naturalize, them. A purely native silk can be produced, and the cultivation of such a stock would be the best foundation for a silk industry. Understanding must be the parent of skill. Domestication of the native and acclimatization of foreign must precede the cultivation of a useful product.

NOTES ON A SPECIES OF BRYOBIA INFESTING DWELLINGS.

BY F. M. WEBSTER.

For the last two years, during spring, there have appeared in a number of residences in La Fayette, Ind., great numbers of small, active, brown mites, which, while apparently doing no harm, created much consternation among the painstaking housewives.

There are a number of species of Bryobia in this country, two of which (*B. pratensis* and *B. pallida*) were described by Mr. H. Garman as infesting meadows in Illinois,* but the present species appears to be undescribed.

*Fourteenth Report State Entomologist Ill, pp. 73 and 74.

On May 26 of the present year our attention was called to the swarms of these mites crawling on windows and over carpets and furniture in rooms, some of which were not accessible to sunshine, and had not been kept warm during winter. On June 7, we found the same species exceedingly abundant on the leaves of Timothy on the lawns in the vicinity of the infested dwellings. Those which we had observed indoors were seemingly fully developed, whereas those on the grass were of all sizes, the minute individuals predominating, and usually forming companies or families grouped about mature individuals. A month later however, there were comparatively few remaining on the grass, and they had long since disappeared from the dwellings. On July 29, I could find but a single individual after long search, this one being, as I suppose, full grown. From this date up to September 26, when they were again observed on Timothy, nothing could be found of them on the grasses or indoors. Wherever these mites occurred on the grass the latter soon began to have a scalded appearance. In fact, the prevailing opinion seems to be that the species of Bryobia, found in this country, are of vegetal food habits. This, if true, would indicate that they entered our dwellings for the purpose of hibernating; an idea which is somewhat strengthened by the fact that in some of the houses which they frequented there were no growing plants. Besides this, a species similar to the one observed by me was sent to Prof. A. J. Cook, from Scotts, Mich., by Mr. Adam Haas, on December 12, with the complaint that the window curtains and carpet on the south side of his parlor were full of them.* But, if their object were simply to secure protection from the cold weather, why should they stay so late in the spring?

This occurrence of mites in dwellings is not confined to Indiana and Michigan. In the *Country Gentleman* of June 9, 1881, a correspondent of Susquehanna County, Pa., complains of their occurring on kitchen windows and in a box of clothing in a seldom used chamber, the walls, floor, and furniture of the latter, in the corner near the box, being almost covered with the mites. In his reply Dr. Lintner states that the mites were allied to the red spider. In a private letter of July 9, 1881, Dr. Lintner writes me that under date of June 16 a correspondent complains of the occurrence, in great numbers, of mites in a newly lathed, plastered, and painted house.

In Europe the massing together of a similar species, *Petrobia lapidum*, during autumn, has been repeatedly observed. Dugés found whole families under stones in public walks in the south of France, he having in summer observed it in families on the under side of leaves of the Plane-tree.† What was supposed to be the same species has been several times reported as swarming under pebbles and gravel in England.

*Michigan Farmer, January 9, 1888.

†Economic Entomology. Aptera. By Andrew Murray, pp. 119, 120.

Mr. Albert Müller mentions its occurrence in great numbers in August, on the flint gravel, covering the approaches to Elmer's End Station, near London.*

CRANBERRY LEAF-GALLS.

By Dr. Fr. Thomas, *Ohrdruff, Germany.*

The cranberry-galls mentioned in the periodical bulletin (Insect Life, Vol. I, 1888, p. 112), looking like mite-galls of extremely small size, are *not* made by Phytoptus or any other animal parasite, but by a little unicellular fungus of the genus Synchytrium. The mite-galls of a similar form we find on other plants are purse-like and furnished with an opening, serving as a passage-way for the mites from the opposite surface of the leaf. Microscopical investigation shows the cranberry-galls as not purse-like, but chalice-shaped. On the bottom of the crimson chalice (at the base of the excavation) one cell is much increased in size, the "host cell" of the parasite. It contains only one subglobular fungus-cell, 0.086–0.171^{mm} in diameter, which has a brownish, smooth wall; its contents are colored by chrome-yellow oil. This "resting spore" of the fungus resembles that of *Synchytrium aureum* Schröter, known in Europe as growing upon a great many plants, in the United States on *Lysimachia quadrifolia* L. (cf. Farlow, Botanical Gazette, X, p. 242), but till now unknown or at least undescribed as a gall-maker of Vaccinium. I do not believe that the *Synchytrium vaccinii*, which produces the cranberry-galls, belongs to the former species, no chalice-shaped gall caused by *Synchytrium aureum* having been found yet.

In autumn the cranberry-galls become black and brittle and break off. The resting spores of the fungus fall down to the ground or are set free by the rotting away of the leaves. Next spring the spore germinates, produces (in a manner still to be stated for this species) zoöspores, swimming in water for some time and attaching themselves to epidermal cells of a young cranberry-leaf to re-commence the production of galls. Thus the parasite spreads by water, an infection that can not be limited in a locality in which water sometimes overflows all the ground or runs from one part to the other. A long flooding of the bog can not but result in the further distribution of the disease. The single remedy, I mean, would be to draw out all plants covered with galls in summer or autumn before the resting spores escape.

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* Entomologist's Monthly Magazine, 1867–'68, p. 71.

Note.—Early in December, 1888, Hon. L. B. Custer, of Logansport, Ind., applied to me for a remedy for a species of mite which had taken possession of a dwelling in his city, coming in through the crevices about the windows, as observed by the lady of the house, they having been also observed in the same house the preceding spring.—F. M. W.

It is possible that the same fungus infects other plants, too, and causes there small protuberances or galls on leaves and stalks, and therefore it would be desirable to state the occurrence of such small galls on other plants in the near neighborhood of the diseased cranberries.

EXTRACTS FROM CORRESPONDENCE.

The Red-legged Flea-beetle injuring Peach Orchards.

A peach enemy has sprung up among us that threatens the entire destruction of our orchards unless checked in some way. It is a small beetle, as per inclosed specimen. It partakes somewhat of the nature of the flea and potato-bug. When disturbed they jump rather than fly, and can be shaken off the trees, causing them to drop through the branches like shot. We propose to spray our trees with Paris green (1 pound to 100 gallons). Do you know the name of the insect we refer to, and is there anything better than Paris green for their destruction? Any information you may be able to give us will be thankfully received. [Stover & Stover, Edgemont, Md., May 15, 1888.

REPLY.—* * * The insect which is damaging your peach trees is the Red-legged Flea-beetle (*Haltica rufipes*). Your proposed application of Paris green will probably be satisfactory in destroying the beetles, but of course will not at once put a stop to the damage. Would it not be simpler to shake them down upon sheets placed upon the ground, first saturating the sheets with kerosene so that every beetle falling upon them will be killed? We shall be glad to learn of the success of whichever plan you adopt.—[May 17, 1888.]

The Spider Bite Question again.

I must thank you for sending me INSECT LIFE. While entomology is out of my line now, I usually see something of interest while looking over your journal. In the last number the article on "Fatal Spider Bites" has especially interested me, as I have had a curious experience in the same line, and it may interest you to have an account of it.

In medicine we frequently have rare cases come together. I have had six cases of spider bite, or so diagnosed, where the testimony is more or less convincing as to the venom of spiders

Four of them are rather remarkable, as the history is the same in all, and the symptoms very similar. A man comes home from his work. eats his supper, and goes out to the privy, sits on the hole, comes in contact with a spider's web, and almost immediately is bitten on the glans penis. But a few minutes pass by before there is giddiness and sharp lancinating pains running up into the back and abdomen. The patient is so sick that he goes to bed at once and sends for a physician; there is fever, intense restlessness, and anxiety; the abdominal muscles hard and contracted; the muscles of the face and throat strongly contracted, and swallowing very difficult; the patient appears to be in great agony, and calls for immediate relief; the arterial pressure is high, the pulse hard and rapid. In my first case, a negro about forty five years old, the symptoms were relieved by large doses of morphine subcutaneously, and the patient was up in three or four days. He had incipient phthisis at the time, and died from this disease a year later. There was no point on the glans penis to indicate the bite.

In my second case I was called out at midnight on the suburbs of the city to a mulatto, a large and vigorous man, whom I found in great agony, tossing all over

the bed, and crying out from the same lancinating pains running up into the abdomen and back, the muscles of the whole body strongly contracted, especially the abdominal; there was high fever, the body in a profuse perspiration, and the pulse hard and quick. He gave me much the same history. He had gone out to the privy after his supper, had sat on the hole, had felt the web, and almost immediately the bite on the glans penis, followed quickly by the agonizing pains, so that it was with great difficulty that he reached the house. I gave him large doses of morphia, hypodermatically, and plenty of whisky before he found any relief. This man was sick in bed three weeks; he had fever lasting several days, and some diarrhœa, and he got up much reduced in flesh, very weak, and his muscles all sore from the tetanic contractions.

A third case was that of a strong, muscular white man, who sent for me at midnight, after trying in vain various measures to relieve his violent pains in the stomach and back. He gave me precisely the same history as the other two. He went into his garden after supper to attend to his flowers, went into the privy, sat on the hole, felt the spider's web, and almost immediately the bite. For some minutes he felt no inconvenience; gradually the severe lancinating pains came on, shooting up into the abdomen and back, and they increased to such an extent that he sent for me. I found the same restlessness, anxiety, tetanic contractions, and agonizing pains as in the other cases. I found, moreover, on the glans penis the point of puncture. It was a bright red point, surrounded by a white zone, and an outer red areola, the entire spot measuring about two lines. The testicles were drawn up, and the abdominal muscles very tense and hard. Morphia and stimulants relieved the case, and the patient was out in two days.

The fourth case was that of a boy two years old. His nurse had set him on a privy seat which had not been used for some time, and he immediately complained of something biting him. When seen by me soon after, I found the prepuce very much swollen and edematous, but the child did not complain much. The swelling disappeared rapidly. The evidence in this case is very unsatisfactory, of course.

My fifth case was that of a colored woman, who gave a history of a spider dropping from the ceiling and biting her on the face as she lay in bed. There was a great deal of œdema and pain, and the patient suffered several days. I could find no distinct point of puncture, and the spider was not found.

In my sixth case a man in putting on his sock in the morning was bitten on the toe, giving him a great deal of pain. He was quickly relieved by morphine. He brought me the spider, which I immediately put in alcohol for future examination. Unfortunately, while away from the city, the specimen was lost. There was a red spot on the abdomen, and it resembled very much the female *Latrodectus mactans* figured in your journal.

I am sorry the evidence in these cases is not more direct, and that I can not produce the spiders. I made diligent search in each case, but the webs had been brushed away. While it may be questioned that these cases were spider bites, the collective evidence is in favor, I think, of that explanation. One thing is certain—sitting on old privy seats is not without its dangers, in this part of the country, at any rate. Scorpions are not to be found in Georgia, certainly not in this part of the State. I know of no species of ant capable of producing such a serious bite. We can throw out a bee or wasp sting. The symptoms all pointed to the introduction of a venom or animal alkaloid allied to *tetanine*. The evidence in four cases of sitting on a privy seat, of feeling the web, and immediately the bite, points strongly to the spider as the cause of the trouble.

The intensity of the symptoms in the second case, where the patient was a strong and vigorous man, would lead one to believe in the possibility of a fatal spider bite when the patient was feeble or especially sensitive to the venom of spiders. Of course, it is a mere conjecture as to the species of spider that caused the trouble in these cases. In the first three cases the symptoms were so similar as to suggest but one species. And yet it is not impossible that with spiders, as with the venomous

reptiles, the malignity of the bite may depend upon the condition of the animal at the time. With the rattlesnake, for instance, repeated use of his fangs will exhaust the supply of the poison, requiring some time for its reproduction, at which time the bite will be much less venomous.

I have written out for you my experience, thinking you may be able to make some use of it in your journal.—[E. R. Corson, M. D., 158 Jones street, Savannah, Ga., January 26, 1889.

REPLY.—Your long and interesting letter of January 26 has just come. The record of your spider-bite cases is extremely interesting, and we will publish it in a near number of INSECT LIFE just as sent, making perhaps a few comments. It is greatly to be regretted that in none of these cases was the spider seen or captured, and it is also a matter of regret that you lost the specimen of the one which you think was Latrodectus, and which was the biter in your sixth case. Your letter as a whole affords a very strong bit of cumulative evidence. In none of the outhouse cases is it probable that the Latrodectus could have been the biter, as the spiders of this genus do not live in such places. There are, however, two genera, viz, *Amaurobius* and *Calotes*, which do live in such buildings. Their species are rather large, active, ferocious spiders, which spin abundant webs. The very names of two of the species of *Amaurobius*, viz, *audax* and *ferox*, indicate the character of the spiders. There are other spiders found in these places, viz, the genera *Tegenaria*, *Pholcus*, *Dictyna*, and *Theridium*. The first, however, is probably not the one. The second is too weak, and the third is too small, and the fourth is too shy. It seems to me that the circumstances under which the bites were given in the first four cases are peculiarly favorable, as the parts injured were those which broke the web and which were most exposed and which, at the same time, are perhaps the tenderest parts of the body, being filled with blood-vessels and nerves. It is truly remarkable that all of these cases should have occurred in your practice so nearly together. I suppose that you have not placed them on record before or you would have given us the references. If any similar cases occur again in your practice or in the experience of any of your medical friends I hope that you will not fail to try to secure the perpetrator of the injury.—[January 30, 1889.]

Susceptibility to Insect Poison.

Allow me to refer to INSECT LIFE, No. 7, page 204, instancing the cases of reputed poisoning by *Latrodectus mactans*, where unsuspecting persons had been bitten, resulting fatally, while so many others have been bitten without being seriously injured, and scientific and medical men have often caused it to bite them to test its power for harm The sting of the honey bee is not usually considered serious, but an exception came directly under my observation. During the afternoon of July 12, 1887, I removed some sections of honey from a colony of bees, and as the basswood (or linden) season was nearly finished they had but little to do but to seek revenge. At 6 a. m. the next day as my mother stepped outside the door she was stung upon the temple by an irate bee, while at a distance from the hive of about 100 feet. At 6.30 she was taken with a fainting fit, somewhat spasmodic in its action, which was followed by six others during the next hour and a half. A reclining posture and a dash of cold water into the face would soon restore consciousness. She continually insisted upon sitting up and that she "was better now," until at 8 o'clock, when the worst symptoms began to wear away. The sting had not been removed at first and was not readily found, as there was scarce any swelling or angry blotches in one place more than another to be seen upon the face, and the wound itself seemed very slight. The extremities were swollen and blotched, accompanied by a sensation as of nettles, and very painful, apparently the effect of the virus being suffused throughout the entire system, whereas, when stung, the most of it (the virus) usually appears to linger in the flesh round about the wound, and often causes considerable swelling in the vicinity.

The sting of the wasp, hornet, and bumble-bee is no less virulent, and cases are claimed where healthy men have died from the sting of an individual of each of the above-named insects.

In such cases, were the stings to be removed immediately without pinching the large end which contains the poison sac, thereby charging the wound with poison, and as much of the virus as possible removed from the wound by suction or otherwise, and an alkali, as soda or ammonia water, applied, it hardly seems as if there could be much trouble, unless the poison were to get into the circulation in sufficient quantity almost immediately, which is hardly to be expected. Such occasional circumstances ought not to deter us from keeping bees, but should rather incite us to study nature's laws, lest a single stray bee work much harm; and in case of both bee and spider it seems that not one case in one hundred thousand proves fatal. Indeed, may it not be a fact that radical poisoning and death, caused by these smaller insects of their special orders, have only occurred where the virus was introduced directly into the circulation, either through vein or artery? I am not aware that *L. mactans* is found in Michigan. Have never seen it here. The question whether it has been examined for any glands that may produce a virus and place it in a wound made by the mandibles suggests itself. Also, if such virus has been found, whether its nature be acid or alkaline.

Some points regarding the reported effects of the poison of *L. mactans* may be worthy of note. When once in the system of the man (mentioned by Mr. Dick) who was bitten but did not die, it seemed to remain in the system much as does the venom of the rattlesnake. The formic acid from the bee-sting loses its integrity in a day or two. Its action is quick and decided, but not lasting. The effects of prussic acid upon insects in the "cyanide bottle" are very similar. They very soon succumb to its effects, but even when in a state of lethargy, if placed in the open air, often revive and are soon as well as ever.—[E. W. Allis, Adrian, Mich., February 9, 1889.

The Hay Worm in Kentucky.

Please tell me what is the matter with the hay? The accompanying sample was cut and ricked in the meadow in the summer of 1887, and remained there till a few days ago. When hauling it in, after the hay was unloaded from the wagon, there were great quantities of the large, brown, seed-like bodies all over the rack, among which were little worms and bugs. Are the brown pellets the manure from the worms and bugs? You will observe that the heads of the timothy hay appear to have been eaten out in hollows. In the box I send you are also quantities of the brown substance and worms, just as appeared on the hay frame. —[James F. Askew, Georgetown, Ky., November 26, 1888.

REPLY.—* * * The insect in question is the common Hay Worm (*Asopia costalis*), usually found in clover hay and the life-history of which was first given by me in the *Prairie Farmer* (April 20, 1867), and subsequently more fully in the Sixth Report on the Insects of Missouri. The small round pellets are the excrementia of the caterpillars. This insect is a difficult one to fight, and our only way to defeat its attack is to adopt certain preventive measures. After the haymow is once thoroughly infested, it is almost impossible to destroy the worms without rendering the hay unfit for use. The worm feeds solely upon dried hay, and during summer they are confined to such unfed hay as remains over from the previous year's making; therefore new hay should never be stacked in contact with old. Of course it would be desirable to clean up the barn before putting in the new crop. Salting the hay, especially the 2 or 3 feet near the bottom, is a good practice. Its occurrence upon timothy hay is rather remarkable; for, as before stated, it greatly prefers clover, and, in consequence, will you not kindly inform us whether this particular hay was not stowed near some last year's clover, or upon a spot where clover had been?—[November 30, 1888.]

SECOND LETTER.—In reply to yours of the 30th ult. in relation to the Hay Worm, I will say that there was no clover stacked near the timothy hay, nor had there ever been. The hay will inspect pure timothy, although there is a stalk of red clover scattered here and there in the meadow. I have fed attacked hay to all kinds of stock and have seen no ill results.—[December 22, 1888.

A Rose-bud Cecidomyia.

I take the liberty of forwarding to you for inspection an insect which has made its appearance in a neighbor's rose-houses, and completely destroys all his buds. You will find, on close inspection, a little maggot-like worm close under the bud in all the young shoots I send you. As it is not known to me or any other rose grower I have shown it to, I would like to hear your opinion of it, if not asking too much. Also if you know anything in the way of remedies for it.—[Ernst Asmus, West Hoboken, N. J., September 29, 1886.

REPLY.—* * * This injury appears to be, so far as I know, entirely unprecedented. The insect is the larva of one of the gall midges of the genus Cecidomyia, but no insect of this kind has ever been recorded as feeding in this manner. It therefore becomes of great interest and importance to work this insect up thoroughly, and as a preliminary step I would urge you to send at once to the Department as many of the injured buds with the larvæ as you can find. In addition to this, it would be a good plan to cover with gauze one of the plants, so as to catch the little midge when it issues from the ground.—[October 1, 1886.]

SECOND LETTER.—* * * The maggot Cecidomyia has made its appearance in two different florists' establishments this fall in my neighborhood, if I have been rightly informed, in both cases having destroyed the whole crop [of roses]. They seem to appear in the fall only, as I have not heard of any later. * * *—[January 18, 1889.

Beetles infesting Yeast Cakes.

I send in this mail a box of yeast cakes that are infested. Will you kindly send me the name or names of the animals? They appear in the boxes of yeast during the months of August and September, and do not trouble us much at any other time. The boxes in which they are put up are covered with a paper label, seemingly in such a way that no insect could get in. Is it possible that the egg is hatched in the meal, and that the insect develops in the yeast? Apparently the only way to get rid of them is to prevent their developing in the boxes. Can you suggest any preventive that might be placed in the box which would make a part of the composition of the box itself? The boxes used are like the one I send you. Could oil of cedar be used? * * * In the process of making the meal is raised to about 90° F. Would this kill the eggs?—[W. K. Higley, College of Pharmacy, Chicago, Ill., October 4, 1888.

REPLY.—* * * Your yeast cakes were infested by *Silvanus surinamensis* and *Læmophlœus pusillus*, two insects which are very general feeders and very common in drug stores, feeding upon all sorts of medicinal roots, barks, herbs, and powders. Both species also feed upon meal and flour. The box which you sent was not at all tight, and it would be very easy for the beetles to work their way under the cover. If the label is securely pasted on and completely encircles the box the insects can not enter without piercing the paper, which they will not be apt to do. If the eggs or any young larvæ were contained in the meal they would probably not be destroyed by a heat of 90° F. An easy way to kill them would be to subject them before use to a heat of 110°, and then the only protection necessary after this course is taken will be to pay particular attention to and secure gumming of the label around the edges of the cover. * * *—[October 7, 1886.

Mites in Flaxseed.

I inclose sample mites taken from flaxseed that has been stored since last fall. Will you kindly tell me what these turn to, and if they will die out when cold weather comes? Will you say at the same time if they cause any damage to the seed, either in appearance or shrinkage in weights? * * *—[Albert Dickinson, 115 Kinzie street, Chicago, Ill., September 16, 1886.

REPLY.—* * * The seed has been infested by the mite known as *Tryoglyphus siro*, but there is also another mite present which is predaceous in its habits, and which is killing off the original mites in great numbers. This predaceous mite is *Cheyletus eruditus*. This case is precisely comparable to one that was brought to our notice a year ago by a Milwaukee firm. In that case a prediction was made that within a few weeks the mites would disappear, and it seems probable that in the case of your flaxseed the same thing will occur. If it seems worth while to take the trouble, I would advise the thorough sifting of the seed in the sacks which have been observed to be infested, in order to get rid of the brown earthy-looking substance, which is nothing more nor less than the bodies of the destroyed mites.—[September 18, 1886.

Insects at Electric Lamps.

* * * These beetles (*Galeruca xanthomelæna*) were very injurious to elm trees in Poughkeepsie, N. Y., last summer. Some bands of cotton soaked in oil (I think they were) had been placed around the tree, but did not seem to be of much service, since I picked large numbers of pupæ out of them which afterward developed healthy beetles. The beetles came into the electric lights much less than I should have supposed, for though there were thousands of other species of Coleoptera and Lepidoptera, such as *Leucania unipuncta*, *L. harveyi*, *Cacœcia fervidana*, and a species of beetle unknown to me (of which I took in one week from one-third of the lamps of the city over 6,000), *Galeruca xanthomelæna* was quite scarce, hardly numbering 100 specimens, I should think, in the week's catch above referred to.—[Harrison G. Dyar, Boston, Mass., February 8, 1889.

NOTE.—The beetle referred to was *Harpalus pennsylvanicus*. Of the other Coleoptera a large percentage were Carabidæ.

Bees versus Fruit.

I see that a statement of the experiments of N. W. McLain, of Aurora, Ill., with honey bees, is going the rounds of the papers as conclusive evidence that bees do not puncture grapes. As an observer of the facts in the case, and a practical fruit-grower for the last thirty-five years, and with several colonies of bees quite a portion of the time, I am prepared to say that those experiments are not conclusive. Bees have striking peculiarities, as you are well aware, and in none are they more peculiar than in their tastes. They attack certain varieties of peaches with great avidity, working through the skin and eating into the flesh even before the fruit is thoroughly ripe, while other varieties, to our taste sweeter and riper, are left untouched. Hale's Early is always a favorite with them without reference to the supply of other food. Grapes they do not attack except under certain conditions. These conditions apparently are that the fruit must be very ripe, the weather dry and warm, and other food scarce. They have sometimes destroyed, or rendered unfit for market, tons of grapes in our vineyards in a single day, puncturing the skin so juice would ooze from several grapes in almost every cluster. I had some controversy with Professor Cook, of the Michigan Agricultural College, three or four years ago on the subject, and quoted from some of your observations that bees would under certain conditions attack and damage fruit. With your consent I would like to make use of any facts you may have bearing on the subject. As I do not now remember where to look for the statement I then referred

to, I will be greatly obliged if you will give me the facts or reference.—[H. G. Tryon, Willoughby, Lake County, Ohio, December 6, 1886.

REPLY.—* * * My opinion concerning the question of Bees *vs.* Fruit has for a long time been identical with your own, viz, that under certain conditions bees will and do injure certain varieties of fruit. This opinion was arrived at, however, without thoroughly satisfactory experimentation upon my part, and it was with the view of settling the point, so far as it was possible to settle it by experiments, that I instructed Mr. McLain to carry on the series of experiments to which you refer. As you seem to have seen a newspaper account only, I take pleasure in sending you by to-day's mail a copy of my report for 1885, which contains on pages 336 to 339 the details of his work in this direction. My own comments you will find in the introduction on page 212. I freely admit that my remarks upon his results might have been more qualified and that where I state that the experiments show pretty conclusively that bees do not injure fruit at first hand, I should have said "grapes" instead of fruit, as the experiments were made principally with grapes. You will notice that the word "conclusively" is qualified, and in reality the more I study the matter the more the difficulties of settling the question by such a series of experiments are forced upon me. You must admit, however, that these experiments place the burden of proof upon the affirmative side as far as grapes are concerned.—[C. V. R., Dec. 16, 1886.

Hydrocyanic Acid Gas Treatment for Scale Insects.

* * * I again visited Mr. Gilman a few days ago, and was pleased to learn that he had met with very good success in fumigating his orange trees with hydrocyanic acid gas passed through sulphuric acid; we carefully examined several trees that he treated with the gas when I was there a little over a month previously, and were unable to find any living Red Scales (*Aspidiotus aurantii*), while the fruit and foliage were uninjured. Mr. Gilman says that he treats on an average four trees an hour, using the one apparatus which operates two tents, and estimates that the cost will amount to about 65 cents per tree, his trees being from 10 to 14 feet high by the same in diameter. If it will not be necessary to again treat these trees until after the lapse of four years, this will reduce the cost of treatment to less than twenty cents a year for each tree. Mr. A. Scott Chapman, of San Gabriel, in this county, informs me that some of his father's orange trees that had been treated with this gas nearly two years ago are still remarkably free from the Red Scale, notwithstanding the fact that the adjoining trees are thickly infested with them. The trees treated with this gas, however, are quite as thickly infested with the Icerya as they were when first treated, which clearly shows the great difference in the dispersive habits of these two species.

While at Mr. Gilman's I picked up the following insects from beneath some of the trees which he had just treated with the gas: one *Chilocorus bivulnerus*, two *Exochomus pilatei*, six *Coccinella abdominalis*, four *Psyllobora tædata*, one *Diabrotica trivittata*, four *Largus succinctus*, one *Euschistus tristigmus*, two *Ophion macrurum*, six *Chrysopa* sp.?, five *Musca domestica*, two *Mydea* sp.?, and one spider. The next day all had recovered with the exception of one Largus, the two Ophions, one Chrysopa, the five Muscas, one Mydea, and the spider. Mr. Gilman says that when he leaves the tents charged on the trees all night all of the Lady Bugs on these trees will be killed. The other trees are each confined in the gas twenty minutes, which includes the ten minutes required for generating the gas.—[D. W. Coquillett, Los Angeles, Cal., Feb. 1, 1889.

New Enemy of the Chinch Bug.

I notice you don't mention, as preying on the Chinch Bug, the *Casnonia pennsylvanica* that I found swarming in sheaves of wheat that was infested with the Chinch, while assisting with harvest in Illinois. Years later I found a Casnonia with a Chinch in its mouth among a scattered colony of the latter, at the base of a leaf of green young

corn. But I lost the captor and its victim, the former slipping out of my finger by its thin, flat, long body. I think Casnonias are better fitted to hunt the Chinches than the Coccinellæ, unless the latter are more efficient in the larval state. * * *—[Emile Longuemare, St. Louis, Mo., October 20, 1888.

Army Worm in 1888.

* * * The Army Worm appeared in this section in greater numbers than I ever saw before. They hurt the Barley crop along the lake in Monroe County, 20 per cent. They seemed to be more numerous near the lake. Nearly all I examined were Ichneumonized.—[Harry S. Burnett, Kendall, Orleans Co., N. Y., September 27, 1888.

STEPS TOWARDS A REVISION OF CHAMBERS'S INDEX,* WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord Walsingham.

[*Continued from page* 268.]

CEROSTOMA Latr.

Cerostoma radiatella Don.

=*Pluteloptera ochrella* Chamb.

In describing the genus *Pluteloptera*, of which his species *ochrella* is the type, Chambers wrote: "Fore-wings: These differ from those of *Plutella cruciferarum* only by having two branches of the discal vein continued through the cell in which they unite, forming an independent, elongate, triangular cell, beside the secondary cell seen in *Plutella*."

In this and in all other respects the neuration as described and figured agrees with that of the genus *Cerostoma*, and a comparison of a Texan specimen obviously such as Chambers had before him when describing *P. ochrella* from Texas, with a full series of Californian and European examples of *Cerostoma radiatella* Don., confirms the identity of the species.

The figure of the hind-wing in Chambers's plate is not well shaped, but I have no doubt that *ochrella* is merely a synonym of the common and widely distributed *C. radiatella* known to be extremely variable in color and markings; many European specimens being exactly similar to the Texan form. The second joint of the palpi is somewhat more thickly clothed in European than in American specimens, a peculiarity which occurs also in Cleodora.

Cerostoma subsylvella sp. n.

Palpi, on the inner side whitish, the outer side of the long dependent tuft of hairs fawn color; apical joint whitish.

Antennæ, white, annulated with fawn brown.

Head and thorax, pale fawn color.

Fore-wings, pale fawn color, sprinkled and mottled with fawn brown, a patch of dark, purplish fuscous scales on the dorsal margin near the internal angle, and another preceding the anal angle, a faint indication of two similar spots on the costal margin in some specimens, one of which is opposite the second dorsal spot; a few dark scales at the apex. [The dorsal spots are not continued across the wing as in the European species *sylvella*, and partially in *alpella*, nor is there any indication of a longitudinal streak as in the allied American species *cervella* Wlsm.]

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*Index to the described Tineina of the United States and Canada. V. T. Chambers. Bull. U. S. Geol. and Geog. Surv., IV (1), 1878.

Hind-wings, gray, with paler cilia.

Abdomen, fawn gray.

Exp. al., 34^{mm}.

Habitat, Esquimalt, Vancouver Island; 5 ♂, 2♀; collected by Mr. J. J. Walker; beaten from Oaks, August, 1882.

Type. ♂ ♀, *Mus. Wlsm.*

TRACHOMA Wlgrn.

Trachoma senex sp. n.

Palpi, tawny, profusely sprinkled with gray; the upper surface of the second joint and the apical joint almost entirely hoary-gray.

Antennæ, tawny, faintly annulated with gray.

Head, tawny; face sprinkled with gray.

Thorax, tawny.

Fore-wings, tawny, sprinkled and transversely streaked with hoary-gray, having several patches of raised tawny scales on the basi-dorsal half of the wing, and one before and above the anal angle; the hoary-gray sprinkling on the basal half of the wing is interrupted by slender lines of tawny scales, and some chestnut-brown is scattered about the fold and the base below the costa; at the middle of the costal margin is a dark tawny-fuscous patch, containing some raised scales, and followed by a chestnut-brown shade, sprinkled with hoary, at its upper edge, and crossed by two longitudinal tawny lines on its lower half; adjacent to the outer end of the lower line is a short oblique streak of pure white; the apical portion of the wing on the costal margin is thickly sprinkled with hoary-white, except the extreme apex, where the chestnut-brown predominates; the apex is falcate, and immediately below it is a pale fawn spot in the cilia; below this the cilia are bright chestnut-brown to the anal angle, where a few tawny-gray scales are intermixed.

Hind-wings, gray, with a faint purplish tinge; cilia somewhat paler.

Abdomen, gray; anal tuft inclining to ocherous.

Exp. al., 20^{mm}.

Habitat, a single ♀, for which I am indebted to Professor Riley, is labeled "Placer County, Cal., Aug."

Type, ♀, *Mus. Wlsm.*

This species is allied to the European *Trachoma horridella* Tr. but differs in the abundance of hoary scales, in the oblique white spot at the end of the cell, and in the chestnut-brown on the costa and at the anal angle.

PTEROLONCHE Z.

Pterolonche lineata sp. n.

Head, antennæ, and palpi, bone-color; the antennæ strongly setulose; palpi porrect, somewhat arched, apex slightly depressed, extending to the length of, approximately, 5^{mm}.

Fore-wings, bone-color, marked throughout with slender longitudinal lines of a darker bone-gray tint, following the veins and the fold and evenly distributed over the wing, as well along the upper portion of the discal cell as beyond its margins; counting these lines across the wing, 8 are distinctly traceable, and a rather short one, tending inwards from the end of the cell, lies between the 4 upper and 4 lower ones; cilia, smoky-gray. Under side somewhat darker than the upper side, having a besmeared, smoky tinge, except along the extreme costal and dorsal margins.

Hind-wings, smoky-gray with a slight brownish tinge; cilia the same but with a pale line along their base and another at their tips. Underside also smoky, but the pale costal margin is rather wider than in the fore-wings.

Abdomen, of the single ♂ before me is denuded by grease; genital appendages very peculiar, the stout pointed uncus projecting far beyond the lateral claspers, of which there are apparently 2 pairs; the upper ones, bulging and rounded above, have attached to their lower edge, small supplementary processes, narrow at the base, swelling towards their ends, and armed with a brush of hairs; the lower pair, somewhat spoon-shaped, narrower at their ends than in the middle and curving slightly inwards.

Legs, bone-color.

Exp. al., 36^{mm}.

Habitat, Arizona.

Type, ♂, *Mus. Wlsm.*

The addition of this interesting genus to the North American fauna rests on the reception of a single ♂ in fine condition from the late H. K. Morrison.

COSMOPTERYX Hb.

Cosmopteryx nitens sp. n.

Palpi, shining bronzy.

Head and face, bronzy-brown.

Antennæ, brown, the apex white and a single narrow white ring about $\frac{3}{100}$ inch from the apex.

Fore-wings, brown, with two conspicuous golden spots at about one-fourth from the base, the upper one scarcely separated from the costal margin, the lower one somewhat larger and extended posteriorly; at about the middle of the wing is a straight transverse golden fascia with a slight rosy or coppery hue, preceding a pale-yellow patch, which is margined by a broad oblique coppery-golden fascia terminating in a white streak on the costa. The pale-yellow patch is divided longitudinally by a rather wide and conspicuous streak of black, extending to the golden fascia on each side, and somewhat nearer to the costal than to the apical margin; the apical portion of the wing is brown, with a slender golden streak along the base of the dorsal fringes, commencing beyond the oblique outer fascia and terminating with some silvery scales at the apex.

Cilia and hind-wings, shining bronzy.

Abdomen, brown, with some shining metallic scales about the sides and anal segments.

Legs, brown, banded with silvery white; spurs also silvery.

Exp. al., 10^{mm}.

Habitat, 2 specimens from Professor Fernald from Texas and 1 from the late H. K. Morrison from Southwest Texas.

Type, ♂, *Mus. Wlsm.*

Cosmopteryx pulcherrimella Chamb.

Chambers, before describing *pulcherrimella*, suggests that *gemmiferella*, *clemensella*, and *pulcherrimella* Chamb. are all one species, and then proceeds to describe the latter as new and distinct. From specimens in my own collection I am able to separate the species with the greatest facility, not only by the pattern and coloration, but also by the position of the white rings on the antennæ. These will be found to present a constant character, so far as my observations go, throughout the different North American species of this genus, which could easily be tabulated systematically.

Cosmopteryx chalybæella sp. n.

Antennæ, brown, a white line along the side of the basal joint and running approximately through half their length; apex white, with two or more white rings, preceded by a dark band before it.

Palpi, whitish, with a slender line of brown scales extending along the outer side of the apical joint.

Head, brown, with central and lateral slender white lines running back over the thorax, which is also brown; face whitish.

Fore-wings, brown, with two short rather broad silvery dashes at about one-fourth from the base, the first nearest the costa, commencing also nearest to the base; a very slender silvery line from the base along the dorsal margin; and a short oblique streak of the same color tending downwards from the costal margin towards the apex of the upper dash; beyond the basal half of the wing is the usual orange-yellow space, limited internally and externally by shining steel-gray metallic spots, the pair adjacent to the costa being much wider apart than the opposite pair, which are adjacent to the dorsal margin; there is a white streak in the costal cilia touching the upper and outer metallic spot, and a similar apical streak is continued a very short distance along the dorsal margin; cilia steel-gray, with a slight greenish tinge.

Hind-wings and cilia, the same color.

Legs, brownish; tarsal joints smeared and spotted with white.

Exp. al., 6^{mm}.

Habitat, Southwest Texas (Morrison).

Type, ♂, *Mus. Wlsm.*

Cosmopteryx quadrilineella Chamb.

I have a single specimen from Sonoma County, Cal., taken in May, 1871, which agrees in size and pretty closely in markings with this species, to which I am inclined to think it belongs. Although the specimen is in somewhat poor condition it can be easily recognized as distinct from *delicatella*.

Cosmopteryx delicatella sp. n.

Palpi, silvery, with some brownish scales towards the base.

Head, brown.

Antennæ, brown, the apex broadly white with two narrow white rings separated from the apex by a still broader brown band.

Thorax, brown, with three narrow silvery white streaks, one central, extending from the head along the thorax.

Fore-wings, brown, the basal portion with four narrow silvery-white lines; the first from the base of the costa tending somewhat downwards; the second commencing opposite to the middle of the first and extending somewhat beyond it; the third commencing beyond the origin of the second and extending very slightly beyond it; the fourth immediately above the dorsal margin, commencing near the base and extending to the origin of the third; about the middle of the wing is a broad pale-orange band, on the basal edge of which are two golden spots, the upper one opposite the end of the second basal streak, tipped with blackish scales; the second farther from the base, larger and more conspicuous than the first, situated opposite to the end of the third basal streak; at the outer edge of the pale-orange band are two similar spots separated by a narrow extension outwards of the orange color, the first situated immediately above the other, but not touching the margins of the wing; a small white streak extends outwards along the costa from the upper spot, and from the narrow extension of the orange band there runs a slender silvery-white line, somewhat arched upwards and terminating in the extreme apex of the cilia; the space above and below it, including the cilia themselves, being of the same brown color as the base of the wing.

Hind-wings and fringes, also brown.

Abdomen, brown, anal segments tending to ochreous.

Legs, brown, spurs and tarsal joints whitish, tibiæ also streaked with white.

Exp. al., 10^{mm}.

Habitat, North Carolina. Two specimens from the late H. K. Morrison.

Type, ♂, *Mus. Wlsm.*

This species evidently approaches very closely to *quadrilineella* Chamb., having the same characteristic four lines on the basal portion of the wing; it has, however, four metallic spots, not three, and a conspicuous white streak on the costa not mentioned by Chambers; moreover, its size is considerably greater than Chambers's species, and it is observable that all the species of this genus are extremely uniform in the expanse of the fore-wings.

Cosmopteryx unicolorella sp. n.

Palpi, brown, with shining white lines along their upper and under sides.

Antennæ, brown, with the basal joint enlarged outwardly, a slender silvery-white line on their upper sides along the basal half, very coarsely scaled beyond the middle; the four apical joints white, preceded by a broad, brown band, which is preceded by one, and after short intervals by three more white joints.

Head and thorax, brown, with three silvery-white lines; one from the top of the head runs along the middle of the thorax, two from the bases of the antennæ along the upper edges of the tegulæ.

Face, shining silvery.

Fore-wings, rich brown; a slender bluish-silvery line from the base along the costa; its outer half turning slightly downwards reaches one-fourth of the wing length; an equally slender silvery-white line reaches somewhat farther along the dorsal margin, and between the ends of these are two short detached silvery streaks; across the middle of the wing is a beautiful purplish, steel-colored, metallic fascia, not quite reaching the extreme costal or dorsal margin; beyond it (without any orange or yellow band, as is usual in this genus) are two large spots of the same color, the first dorsal, the second beyond this costal, from which a conspicuous white dash passes upwards through the costal cilia; the extreme apex is fuscous, with another conspicuous white dash in the cilia below it, preceded by a marginal streak of metallic scales; cilia, brownish-fuscous.

Hind wings and cilia, brownish-fuscous.

Abdomen, brown, with two rather silvery bars before the pinkish-white anal tuft.

Legs, brown; the tibiæ streaked and the hind tarsi spotted at the joints with silvery-white on their outer sides; spurs whitish with conspicuous silvery-white bands around the legs at their bases.

Exp. al., 14^{mm}.

Habitat, Siskiyou Co., Cal. A single ♂ taken in the beginning of June, 1872.

Type, ♂, *Mus. Wlsm.*

GENERAL NOTES.

BLEACHING WINGS OF LEPIDOPTERA.

By the Dimmock process the wings are first acted upon by a saturated solution of the chloride of lime, chlorine being, of course, the bleaching agent. Afterward they are washed in water to which hydrochloric acid has been added, to get rid of the slight deposit of lime. The process is a slow one for thickly-scaled, dark-colored insects, and it occurred to me to try a mixture of the chloride and acid, liberating the chlorine gas. The method was absolutely successful, the wings decolorizing immediately

and being ready for the slide within two minutes. In fact, very delicate wings can scarcely be taken out quick enough, and need very little acid. The advantage is the rapidity of work and the certainty of retaining the wings entire, the chloride of lime sometimes destroying the membrane in part before the bleaching is complete. The disadvantage is the vile smell of the chlorine gas when liberated by the combination of the two liquids. For quick work this must be endured, and the beauty and completeness of the result are also advantages to counterbalance the discomfort to the senses.—J. B. S.

WINTER APPEARANCE OF THE CECROPIA MOTH.

Mr. Warren H. Manning, of Reading, Mass., informs us that Mr. Clark, of the Boston Park Commission, found two specimens of *Attacus cecropia* January 12, 1889, in the street in Boston, apparently numbed by the chilly air. This was one of the results of the long period of mild, spring-like weather in the latter part of December and the first of January, and affords an indication of the probable issuing at that time of many other insects, thus proving what we have so often stated, that the severe winter is more favorable to the successful hibernation of insects than a mild, open winter.

IS MARRIAGE A FAILURE?

Our esteemed correspondent, Mr. R. Allan Wight, of Auckland, New Zealand, to whom we have already referred in these pages, contributes the following to the literature of this important question of the day:

It does seem as if Mr. Green's discovery, that his Ceylon parasite of the spider attacks the *female* only, may have something to do with her propensity to destroy the male as soon as he has fecundated—by the bye, is not that a method of preventing "marriage being a failure" and still avoiding the objectionable divorce? I have been watching two house-spiders in my bed-room (which I would not allow to be removed). The female for more than a month not only allowed her companion to live, but *certainly* manifested plain signs of affection. They were never more than an inch apart, and one was sure to come up to the other if it moved away, placing the feet and legs over it (may I say the hands and arms?). If disturbed, they ran into their back parlor and hid, close-touching, but it did not last long. Whether flies were scarce or not, I can not say, but she killed him and sucked his juice in the end. But the most singular thing is that ever after that she does not seem very alert, and remains always close to the body, and now (after about six weeks) she is dead, hanging close to it, and the broom has been allowed to close the record.

INSECTS UPON THE COFFEE AND TEA PLANTS IN CEYLON.

Our valued correspondent, Mr. E. Ernest Green, of Eton, Punduloya, Ceylon, sends the following interesting notes upon insects affecting Coffee, supplementary to those mentioned by Mr. J. Neitner some years ago:

Allow me to thank you for your very interesting periodical, INSECT LIFE, in the interests of entomologists and agriculturists. I hope your example will lead the way for many other similar publications.

I am sending you, under separate cover, a small pamphlet on "The Enemies of the Coffee Tree," compiled by the late Mr. J. Neitner. Since the publication of this paper many new enemies have made their appearance, notably the *Lecanium viride*, which has practically wiped out coffee cultivation in many districts. Its vigor, the rapidity with which it is propagated have defied any remedial measures that we could afford to apply, and consequently planters are everywhere turning their attention to the cultivation of tea in the place of coffee. The tea plant also has many insect enemies; but, from the method of cultivation, which allows of periodically pruning down the bush, it is better able to withstand them.

I have noted as enemies of the tea, several species of "Red Spider," Tetranychus and allied genera.

Lecanium coffeæ and a species of Aspidiotus. (Fortunately the *Lecanium viride* does not flourish on the tea plant).

Termes fatalis, which eats through the stem just below the surface of the ground.

Several small Lepidoptera belonging to the Tortricidæ

A boring larva, *Zeuzera coffeæ*.

The larvæ of *Agrotis consureata* and *A. diffusa* are very mischievous in nurseries of young tea plants.

There are numerous other caterpillars that feed upon the leaves of the tea, but damage caused by them is so small as to be of no account.

It may interest you to know that specimens of a Lecanium found by me on mango leaves, and sent to Mr. J. W. Douglas, of London, have been identified by him as *L. acuminatum*, Signoret (Essai sur les Cochenilles, Annales de la Soc. Entom. France, 1873, p. 397, Pl. 12, fig. 1) described from specimens found on orchids in the Luxembourg gardens in Paris. Mr. Douglas tells me he has lately received this same Lecanium from Demerara, where it is found upon both mango trees and orchids.

It has for some time seemed to us that the scale insects of the coffee plant which do so much damage in Ceylon and other parts of British India could be successfully treated with the remedies which we have found in this country so valuable against the scale insects of the orange, viz, the kerosene soap emulsions, and we hope soon to bring this before the attention of the British Government.

PLANTS INJURED BY CAPSUS QUADRIVITTATUS.

Mr. Warren H. Manning, of Reading, Mass., sends the following list of plants injured during 1888 in Brookline, Mass., by this plant-bug:

The following plants were injured considerably, many others slightly:

Deutzia crenata, badly.
Galium boreale.
Heliotrope (garden), badly.
Lemon Geranium.
Valeriana officinalis, badly.
Tanacetum vulgare.
Aralia spinosa.
Acer Japonicum.
Lysimachia clethroides, badly.
Achillea sp.
Ranunculus acris fl. pl. badly.
Phlox suffruticosa, not P. paniculata.
Hydrangea paniculata grandiflora.
Hibiscus Syriacus.
Philadelphus coronarius aureus.
Lunaria rediviva, very badly.
Campanula persicæfolia.
Polemonium reptans.
Hypericum perforatum, badly.

This insect's impartiality is noticeable, taking, as it did, acrid, bitter, aromatic, and sweet tasting leaves, and smooth or rough surfaces.

IMMUNITY OF SOUTHERN DAKOTA FROM THE CHINCH BUG.

Our old-time friend and correspondent, Mr. W. W. Corbett, of Fargo, wrote us recently concerning the possibility or probability of the appearance of the Chinch Bug in destructive numbers in Dakota. The subject is one of general interest and we copy at length from our reply:

The question which you ask in yours of the 25th ultimo is not one which admits of a thoroughly satisfactory answer. I have thought sometimes that there was danger ahead for the wheat crops of southern Dakota from the Chinch Bug, and I have expected to hear of damage from it. The immunity so far experienced is doubtless due to the fact that the Chinch Bug is essentially a southern insect, occurring in its greatest abundance in portions of the country where the winters are not so severe as they are with you. Occasionally, however, they do some damage as far north as Wisconsin and even parts of southern Minnesota, and I should not be surprised at any time to learn that a race of the species had established itself in these more northern sections and had adapted itself to the more severe cold of your winters. Such an occurrence may, however, be indefinitely postponed. From my experience I would say that your blizzards will prove a great protection against it, but at the same time I would keep on the look-out, and if I had large wheat interests in your vicinity, and were not an entomologist, I would not fail to post myself upon the habits of this insect and watch for it constantly. Another cause of your immunity up to the present time, I think, may be found in the common practice of burning the prairies in autumn in the country that is perfectly new, for this custom has the effect of destroying the bulk of the Chinch Bugs that otherwise would hibernate, and upon these grounds you may expect in the more southern part of your Territory that the insect may become more numerous in proportion as the country is settled up and fenced and prairie fires are prevented.

BURNING THE STUBBLE FOR HESSIAN FLIES.

Mr. Fred Enock and Miss Ormerod have carried on a spirited discussion in the columns of the *Mark Lane Express*, of London, on the advisability of burning the stubble as a remedy against the Hessian Fly. Mr. Enock holds that it is bad policy for the reason that the parasites of the pest are thus destroyed along with the unparasitized puparia. He advocates an extensive rearing of parasites, and an endeavor to cultivate them artificially in order to liberate them afterward in the fields. Miss Ormerod takes quite the contrary view, and holds that burning of the stubble regardless of parasites is the better plan. We had occasion during January to write Mr. Enock upon this subject, and quote from our letter as follows:

* * * The question under discussion is an old one, and one which will probably never be settled to every one's satisfaction. Theoretically you are right, and practically Miss Ormerod is right. At present, and with general entomological knowledge in its present state, there can be no doubt that it will be advisable to burn or otherwise destroy screenings which examination shows to contain puparia. It is a great bother for any one to try to breed parasites, and for a practical man it is out of the question. The burning of stubble is something which depends entirely upon local conditions. * * * There are cases when the consideration of the parasites has an immense practical bearing, but with the Hessian Fly in England to-day I am inclined to believe that the study of the parasites is of value only as indicating the origin of the pest and, by observation of their numbers, as a means of prediction during a

given winter of the probable abundance of the fly during the next summer. The more you experiment in the direction set forth in your articles the more I believe you will be inclined to agree with me.—C. V. R.

Prof. A. J. Cook writes us under date February 15, as follows:

You speak—INSECT LIFE, p. 197—of abnormal bees. I have a still stranger case—a bee half drone and the other half worker. This division is lateral. One side—jaw, eye, wing, and leg—is drone, the other worker. I have seen several bees which have head and thorax of worker and abdomen of drone, or vice versa. This longitudinal sex differentiation is quite new to me.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

February 7, 1889.—Mr. Howard read a paper entitled "Notes on the hairy eyes of some Hymenoptera," in which he discussed the appearance of these hairs and reviewed the very scant literature on the subject, calling attention to the fact that hairy compound eyes occur here and there in isolated genera or groups of genera in many families throughout the order, indicating the genera in which they are known. He announced their discovery in a number of genera of minute Chalcids in which they had not before been recorded, and mentioned the curious fact that there was no gradation between a perfectly naked eye and an eye in which the hairs were comparatively long and perfectly plain. He concluded that these hairs were probably at present functionless and of much less classificatory value than their apparent close relationship with such an important organ as that of sight would seem to indicate.

Mr. Smith remarked in discussion that in the Lepidoptera three variations in the eye were used, *i. e.*, the naked, the lashed, and the hairy. In the Noctuidæ these variations were of generic importance. Mr. Schwarz stated that they were used in the Coleoptera both specifically and generically.

Mr. F. V. Coville read an interesting paper entitled "Notes on Bombus and Apathus at Ithaca, N. Y." He described his methods of observation, and gave at some length the habits of *Bombus borealis* and *B. fervidus*. He could find no distinction of the males of these two species. He had found the males of *Apathus elatus* in the nests of *B. fervidus*, but no males of the latter species. As the female of *Apathus elatus* is unknown, and as he had found the male copulating with the female of the Bombus, he concludes that the species *Apathus elatus* has no real existence.

A general discussion followed this paper, which was participated in by Messrs. Riley, Smith, Howard, Marlatt, C. R. Dodge, Schwarz, Marx, Townsend, Ashmead, Mann, Fox, and others.

Mr. Ashmead read a paper entitled "A note on the genus Tetracnemus," referring to Westwood's original description as giving 5-jointed tarsi and Walker's subsequent redescription as giving 4-jointed tarsi. He exhibited two species from Florida, the one an Encyrtid corresponding with Westwood's description, and the other an Eulophid corresponding with Walker's.

Dr. Marx commented on a letter received from Judge Johnson and identified several species of spiders which he had sent to the society from Florida. He also stated that he had been informed by letter that M. Simon, of France, had in his collection a second species of the new genus Hypochilus.

WM. H. FOX, M. D.,
Recording Secretary.

PERSONNEL OF THOSE ENGAGED IN GOVERNMENT ENTOMOLOGICAL WORK.

The following list embraces those now engaged in Government entomological work, and who will assist in the management of the periodical; those at Washington editorially, and the others as contributors. The force of the Division of Entomology is more or less inconstant, as it consists of both permanent and temporary employés:

DIVISION OF ENTOMOLOGY, U. S. DEPARTMENT OF AGRICULTURE.

Entomologist: C. V. Riley.

Office Staff: L. O. Howard, First Assistant; E. A. Schwarz, Th. Pergande, Tyler Townsend, C. L. Marlatt, Assistants; Philip Walker, Assistant in silk-culture and in charge of reeling experiments.

Field Agents: Saml. Henshaw, Boston, Mass.; F. M. Webster, La Fayette, Ind.: Herbert Osborn, Ames, Iowa; N. W. McLain, Hinsdale, Ill.; Mary E. Murtfeldt, Kirkwood, Mo.; Lawrence Bruner, Lincoln, Nebr.; D. W. Coquillett, Los Angeles, Cal. Albert Koebele, Alameda, Cal.

DEPARTMENT OF INSECTS, U. S. NATIONAL MUSEUM.

Honorary Curator: C. V. Riley.

Assistant Curator: John B. Smith.

☞ For bibliographical purposes it may be necessary to state that, where expedient, the names or initials of members of the force will be attached to their communications. Where initials alone are appended, the full name can be ascertained by referring to the list above given.

Editorial or unsigned articles or notes should be credited to "INSECT LIFE," or where it is desired to give personal credit, to "Riley and Howard." While most of the correspondence of the Division is carried on by myself, yet much of it is also attended to by my first assistant, Mr. Howard, who acts as Entomologist in charge during my absence, and otherwise so materially assists in editorial and office work that only those articles signed by either should be considered individual. Illustrations, where not otherwise stated, are drawn by Miss Lillie Sullivan, under supervision.—C. V. R.

U. S. DEPARTMENT OF AGRICULTURE.

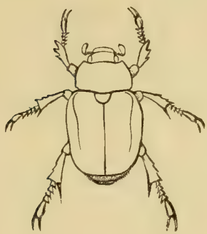
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. APRIL, 1889.

Vol. I. No. 10.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS.



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SPECIAL NOTES.

Mr. Koebele's Mission concluded.—Mr. Koebele returned from Australia and New Zealand by the March steamer. He left Australia late in February, and spent a large part of the month of March in New Zealand with Mr. Maskell and Mr. Wight searching for parasites and other enemies of Icerya. He shipped from Australia before leaving another sending of Monophlœbus and Icerya infested with Lestophonus, and also sent a large number of Coccinellids of four different species, nearly all of which were alive upon arrival in Los Angeles. Mr. Coquillett reports good success in colonizing this shipment, and writes that the Coccinellids particularly made themselves at home, beginning immediately to feed upon Icerya.

In New Zealand Mr. Koebele was unable to find any true parasites, with the possible exception of a small Dipteron, of which, however, he saw only four or five specimens. He found, however, several Coccinellids which feed with avidity upon Icerya, and brought a large number of these to California with him. We expect to publish before long a preliminary report from him on the trip as a whole, which will doubtless prove interesting reading.

One of the interesting results not yet mentioned in these columns was the finding and successful importation of a predaceous Noctuid larva which feeds upon Pulvinaria, Icerya and Lecanium. This insect has received the name *Thalpochares cocciphaga* from Mr. Meyrick, and it may possibly breed and flourish in California, although Mr. Coquillett has just written us that living larvæ received by him refused to feed upon Icerya.

Two other predaceous Lepidopterous larvæ were found by Mr. Koebele, one of which was a Pyralid, which fed abundantly upon *Eriococcus eucalypti*, while the other was a Tineid.

Our Indiana agent, Mr. F. M. Webster, was sent to Australia in December, but remained there only one month and had little opportunity for entomological research, as he was charged with assisting in the preparation of a report for the State Department on the agricultural as-

pects of the Melbourne Exposition. He returned on the same steamer with Mr. Koebele, joining the latter in New Zealand.

Both gentlemen speak in the highest terms of the courtesies which they received both at the hands of the Exposition Board and from prominent men in Australia and New Zealand. Our esteemed correspondent, Mr. Frazer S. Crawford, of Adelaide, was particularly kind and placed every facility at their disposal. It goes without saying that Messrs. Maskell and Wight received Mr. Koebele most cordially in New Zealand.

The Periodical Cicada in 1889.—Brood VIII, which is of the seventeen-year race, will appear this year through quite an extent of country. The region commences in southeastern Massachusetts, extends south across Long Island and along the Atlantic coast of New Jersey, Delaware, and Maryland as far as Chesapeake Bay; then up the Susquehanna River in Pennsylvania, to a point a little below Harrisburg; thence westward in Ohio, embracing the southwestern corner of the State and the northwestern portion of Kentucky, and then upward through southwestern Indiana, ending in central Illinois. It is possible also that there is an eastward extension of the region from Kentucky into southern West Virginia, as Cicadas occurred in 1855 in the Kanawha Valley, and also in the counties of Buncombe and McDowell, in North Carolina; but as these appearances were not verified in 1872, it is probable that they belonged to Brood XVIII, which is of the thirteen-year race.

We shall be glad to receive full accounts this year of all appearances from any of our correspondents, and from all others who will be kind enough to write us of occurrences in their vicinity. Accounts from North Carolina and West Virginia are especially desired, as these will tend to clear up any doubt remaining as to what brood occurred in those States in 1855.

Economic Entomology in California.—We have just received from Mr. W. G. Klee a little work published under the auspices of the State Board of Horticulture, and entitled "A treatise on the Insects Injurious to Fruit and Fruit-trees of the State of California." Mr. Klee is a little weak in his technical entomology, and frequent misspellings of scientific names occur. He quotes freely from other writers, however, and his scientific orthography is not a fault which will trouble his practical readers. His illustrations are mainly borrowed, but most of those which are original are fairly good. His colored plates, which are reprinted from the Biennial Report of the State Board of Horticulture for 1885–'86, are very happy in catching the characteristic appearance upon the twigs, leaves, and fruit of the three species of scale-insects so

figured (*Aspidiotus perniciosus*, *A. aurantii*, and *Icerya purchasi*). He unfortunately, however, reproduces some of the worst of Matthew Cooke's figures, and Comstock's very poor one of *Lecanium hesperidum*. The volume contains also considerable new matter, to which we shall have occasion to refer later.

Kinds Words from a Veteran Entomologist.—The pleasing things which entomologists are writing us concerning INSECT LIFE are very gratifying, but especially so was the following sentence from a recent communication from that veteran and learned entomologist, whom we deem it an honor to call friend, viz, Prof. J. O. Westwood. He writes:

> I congratulate you on the excellent periodical you have inaugurated—INSECT LIFE. I find it full of valuable *new* matter, and its illustrations fully keep up the old style. I wish I could find and support an equal set of clever pupils.

The Lepidoptera of Australia.—We are pleased to learn from a recent communication from Mr. A. Sidney Olliff, of the Australian Museum at Sidney, New South Wales, that the authorities of the museum have recently decided to continue the publication of the drawings and manuscript relating to the life histories of Australian Lepidoptera left by the late Alex. W. Scott and since acquired by the museum. The work of editing and revising this material has been intrusted to Mr. Scott's daughter, Mrs. Edward Forde, and Mr. Olliff. It is to be published on the plan of the three parts which were issued by Mr. Scott before his death, and will probably extend to twenty parts, each containing three or four colored folio plates. The first part is expected about May 1.

Mr. John B. Smith, who has been our assistant in the Department of Insects at the National Museum, has resigned, to accept the more lucrative position of Entomologist of the Agricultural Experiment Station at New Brunswick, N. J. Mr. Martin L. Linell, of Brooklyn, N. Y., has been appointed as an Aid in the Department, and during our absence Mr. Howard will act as Curator. Mr. Linell is an entomologist of considerable experience, and is well fitted to aid in the care of such an important collection as that of the National Museum has become. We regret to lose Mr. Smith from the Washington entomologists, but congratulate him on the appointment, and wish him every success in his new field, in which applied entomology will occupy him more than it has hitherto done.

The Entomologist will sail on the 13th of April for Paris, as one of the Assistant Commissioners to the Paris Exposition, appointed by the

President to report upon Group VIII, which in the main represents agricultural products. Since last autumn much of his time, as the representative of the Secretary of Agriculture, has been devoted to the preparation of an exhibit of the agricultural products of the United States for that Exposition. While his duties in Europe will necessarily prevent active direction of Divisional matters, he hopes by constant correspondence with the office to still keep in communication with the readers of INSECT LIFE.

During his absence Mr. Howard will be Assistant in Charge, and will also act as Curator of Insects for the National Museum.

SYSTEMATIC RELATIONS OF PLATYPSYLLUS, AS DETERMINED BY THE LARVA.*

BY C. V. RILEY.

There is always a great deal of interest attaching to organisms which are unique in character and which systematists find difficulty in placing in any of their schemes of classification. A number of instances will occur to every working naturalist, and I need only refer to Limulus, and the extensive literature devoted during the past decade to the discussion of its true position, as a marked and well-known illustration. In Hexapods the common earwig and flea are familiar illustrations. These osculant or aberrant forms occur most among parasitic groups, as the Stylopidæ, Hippoboscidæ, Pulicidæ, Mallophaga, etc. Probably no Hexapod, however, has more interested entomologists than *Platypsyllus castoris* Ritsema, a parasite of the beaver. I can not better illustrate the diversity of opinion respecting its true position in zoology than by giving an epitome of the more important literature upon it.

J. Ritsema, in *Petites Nouvelles Entomologiques* for September 15, 1869, described the species as *Platypsyllus castoris.* He found it on some American beavers (*Castor canadensis*) in the zoological garden of Rotterdam. He considered it to "undoubtedly" belong to the Suctoria of De Geer, and to form a new genus of Pulicidæ.

In the same year, in the *Tijdschrift voor Entomologie*, second series, Vol. V, p. 185 (which I have not seen), the same author publishes what is apparently a re-description of the insect. He gives his views more fully as to its systematic position, considering that it belongs to the Aphaniptera, and is equivalent to the Pulicidæ.

In the same year, Prof. J. O. Westwood (having previously read a description of the species, November 9, 1868, before the Ashmolean Society of Oxford) published in the *Entomologist's Monthly Magazine*, Vol. VI, October, 1869, pp. 118–119, a full characterization of the in-

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* Read at the meeting of the National Academy of Sciences, April 20, 1888, and here reprinted from Scientific American Supplement, June 2, 1888, vol. 25, p. 10356.

sect under the name of *Platypsyllus castorinus.* A new order, *Achreioptera*, is established upon the species, which he very aptly likens, in general appearance, to a cross between a flattened flea and a diminutive cockroach. "The abnormal economy of the insect, its remarkable structure, the apparent want of mandibles, our ignorance of its transformations, and the possibility that the creature may be homomorphous in the larva and pupa states," are the reasons assigned for establishing the new order, and here Professor Westwood is perfectly consistent, as in his famous "Introduction to the Classification of Insects" the Forficulidæ are placed in the order Euplexoptera; the Thripidæ in the order Thysanoptera; the Phryganeidæ in the order Thrichoptera; the Stylopidæ in the order Strepsiptera; and the Pulicidæ in the order Aphaniptera.

In 1872, Dr. J. L. Le Conte published his paper "On *Platypsyllidæ*, a New Family of Coleoptera" (Proc. Zool. Soc. of London for 1872, pp. 779–804, Pl. LXVIII), in which he shows that *Platypsylla* is undoubtedly Coleopterous, and can not possibly be referred to the Aphaniptera. Careful descriptions and figures of anatomical details are given, and he finds that its affinities are very composite, but in the direction of the Adephagous and Clavicorn series. Its most convenient place is shown to be between the *Hydrophilidæ* and *Leptinidæ.* There seems to be no good reason why the name *Platypsyllus* is here changed to *Platypsylla*, a spelling adopted by most subsequent American writers.

In 1874, Professor Westwood, in the "Thesaurus Entomologicus Oxoniensis" (Oxford, 1874), p. 194, Pl. XXXVII, gives figures with details; reprints his previous diagnosis, and maintains his previous course in erecting a new order for the insect without giving any additional reasons.

In 1880, P. Mégnin, in "Les Parasites et les maladies parasitaires," etc., Paris, 1880, gives (pp. 66–67) a description of the family "Platypsyllines" without expressing an opinion concerning the systematic position. He also describes and figures the species.

In 1882, Dr. George H. Horn (Trans. Amer. Ent. Soc., X, 1882–'83; Monthly Proc., February 10, 1882, p. ii) exhibited drawings illustrating the anatomy of *Platypsylla* and *Leptinus*, and showed that a close relationship exists between these genera. Later, in his "Notes on Some Little Kno w n Genera ad Species of Coleoptera" (Trans. Amer. Ent. Soc., X, 1882–'83, pp. 113–126, Pl. V, 114–116), he reviews the characters, and explains and illustrates the anatomical details. The differences he points out between his observations and those of Le Conte are more particularly in the mandibles. In connection with this paper he also describes and illustrates the structure of Leptinillus, which he separates from Leptinus, and demonstrates their close relationship with Platypsyllus.

In 1883, Le Conte and Horn, in their "Classification of the Coleoptera of North America" (Washington, Smithsonian Institution, 1883),

give (pp. 13–15) a full description of the family characters, a little modified from Le Conte's first description, but sustaining his views on the systematic position of *Platypsyllidæ*.

In 1883, Alphonse Bonhoure (Ann. Soc. de France, 1883; Bull. des Séances, p. cxxvi) exhibited drawings and specimens of *Platypsyllus castoris* found in the *Département des Bouches-du-Rhône.*

In 1884, Edm. Reitter, in "*Platypsylla castoris* Rits. als Vertreter einer neuen europäischen Coleopteren-Familie" (*Wiener entom. Zeit.*, III, 1884, pp. 19–21 (gives a lengthy description of the species with special regard to the sexual differences. He shows that the European insect is not specifically distinct from the American form, but he does not express an opinion on the position of the family among the Coleoptera.

In the same year Bonhoure (Ann. Soc. Ent. de France, 1884, pp. 143–153) more fully records its discovery on *Castor fiber* taken in the Petit-Rhône. It is a question whether this European beaver, now quite rare, is distinct from ours. He gives a very good review of the subject, with a plate of the most important details, after Horn, and he fully indorses the coleopterological position of the insect.

In the same year Ritsema (*Tijdschrift voor Entomologie*, 1883–'84, LXXXVI) refers to Bonhoure's discovery of *Platypsylla* in France, and corrects Reitter in some unimportant details.

In 1885, Reitter, in "*Coleopterologische Notizen*," XIII (*Weiner entom. Zeit.*, Vol. IV, 1885, p. 274), answers Ritsema's criticism.

In the same year, Dr. Friederich Brauer, in his masterly "Systematisch-zoologische Studien" (Sitzb. der kais. Akad. der Wissensch., XCI, p. 364), speaks of the relationship in the thoracic characters between Mallophaga and Coleoptera as illustrated by Platypsyllus, by inference admitting the Coleopterous nature of the latter, but recognizing that it has Mallophagous affinities.

In 1886 H. J. Kolbe, in his "Ueber die Stellung von Platypsyllus im System" (*Berliner entom. Zeitsch.*, XXX., 1886, pp. 103–105), discusses the subject, without any new evidence, however. He concludes that most of its characteristics relate it to the Corrodentia, and particularly to the sub-order Mallophaga, in which it has its closest kinship in Liotheidæ. The remarkable tripartite mentum he thinks should not be compared with the bipartite mentum of Leptinus, and calls attention to the fact that in Ancistrona in Mallophaga it is also trilobed.

The above are the more important papers on the subject, though the insect has been referred by other authors to both Neuroptera and Orthoptera.

CHARACTERS OF PLATYPSYLLUS.

Where the characters of the imago have been so often described, it is unnecessary to refer to them in detail, and I will only call attention to the more striking structural features, and to some omissions by, or differences between, previous authors. A glance at the illustrations

which I nave prepared will show the prevailing characteristics of this interesting creature, its general ovoid and flattened form, and more particularly the flattened semi-circular head. Dorsally, we notice the rather prominent occiput fringed behind with short and broad depressed spines or teeth which form a sort of comb, the prothorax trapezoidal and but very slightly curved, with side margins strongly grooved. There is a very distinct scutellum, and the two elytra are rounded at the tip and without venation. Hind wings and eyes are both wanting. The abdomen shows five segments, each with a row of depressed bristles.

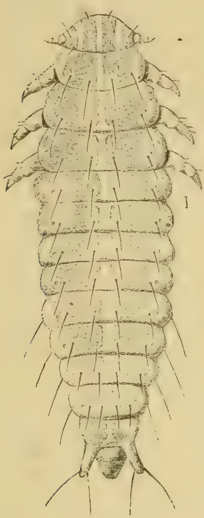

FIG. 67.—Full grown larva of *Platypsyllus castoris*—dorsa lview—greatly enlarged (after Riley).

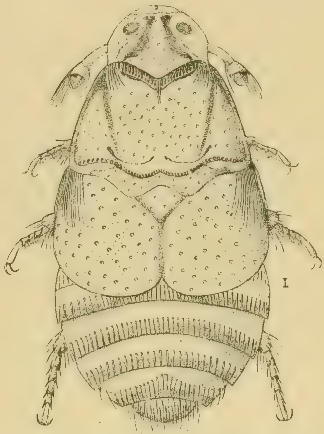

FIG. 68.—*Platypsyllus castoris*, adult—greatly enlarged (after Riley).

On the ventral surface we find among the more curious characteristics, first the antennæ; these were originally described by Westwood as three jointed, the club being annulated. Le Conte could not distinctly make out the number of annular joints upon this club, though he thought he detected seven, which made nine joints to the whole antenna. The club is received in the deep cup-shaped excavation of the second joint. Horn thought he detected a division of the second joint, and resolved but six segments in the club, making also nine joints to the whole antenna, but in a somewhat different fashion from Le Conte. Westwood's figure shows eight annuli to the club. He failed to find any trace of the mandibles, but Le Conte described them as small, flat, subquadrate, with the inner side deeply crenulate, and resembling those

of *Corylophus*; the stipes well developed, and bi-articulate. Horn could not entirely make out the mandibles as described by Le Conte, and rather concluded that what Le Conte described is really one of the granules which occur behind the labrum. He considered that the piece could hardly be even an aborted mandible, because of its diminutive size.

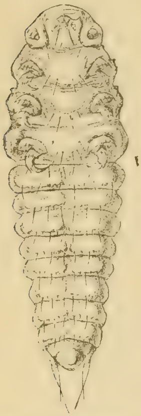

FIG. 69.—Young larva from below—greatly enlarged (after Riley).

What all authors have agreed in calling the mentum is very noticeable, being large and broad, and trilobed behind. The maxillæ are strong, with complicated stipes, and with two flat thin lobes, the inner one smaller than the outer and rounded at the tip, both lobes being ciliate. The maxillary palpi are four-jointed, the labial palpi three-jointed. The prosternum is very large, subtriangular, concealing the insertion of the coxæ, and extending over the front part of the mesosternum, as does this over the front of the metasternum. Six ventral segments of the abdomen are visible behind the posterior coxæ, which conceal two and the base of a third. The coxæ are flat and not at all prominent. The legs are characterized by broad and flattened tibiæ and femora, and the strong spines with which they are armed. The tarsi are five-jointed, the front and middle pair with a row of claviform membranous appendages each side, which Le Conte found only in the male.

American entomologists have been satisfied to follow Le Conte and Horn as to the position of Platypsyllus. Yet with such diversity of opinion on the subject among high European authorities the importance of a knowledge of the adolescent states has been recognized, as the character of either the larva or pupa would settle the question.

During a stay at West Point, Nebr., in October, 1886, I learned from one of my agents, Mr. Lawrence Bruner, that there was a beaver in a creek not far from that point, and I at once made arrangements for him to trap the beaver, and to look particularly for living specimens of Platypsyllus on the skin, and especially the earlier stages. He succeeded in capturing the beaver and sent me some fifteen specimens of the larva and also some imagos, but neither eggs nor pupæ were found. A glance at the larva satisfied me at once of its coleopterous nature; but as we have, waiting to be worked up and published, an *embarras de richesses entomologiques* in the collections of the National Museum, and as circumstances largely decide the precedence, I should probably not have called attention to this larva for some time, had it not been that at the last monthly meeting of the Entomological Society of Washington, Dr. Horn, who was present, announced the finding, the present spring, by one of his correspondents, of this very larva, and exhibited a specimen. Some points about it, and especially the position of the spiracles, being

yet rather obscure in his mind, he requested me to examine my material, which I have thus been led to do. I have made a figure of this larva which will sufficiently indicate its nature.

The general form of the trophi, and particularly the anal cerci, fully settle the disputed point, and remove this insect completely from the Mallophaga (none of which possess them), and confirm its position in the Clavicorn series of the Coleoptera. Yet in the larva, as in the imago, the effects of its parasitic life are shown in certain modifications, which approach the running section of the Mallophaga. Without going into details I may say that, besides its general and more decided coleopterological features, this larva is distinguished by the shortness and stoutness of its legs, by the size and stoutness of the antennæ, by the stiff and long depressed hairs on the dorsal and more particularly on the ventral surface, and by the dorsal position of the abdominal spiracles, all characters approaching the Mallophaga. The first pair of spiracles is lateral, and may be said to be mesothoracic, being placed on the mesothoracic joint, but on a distinct fold. The eight abdominal spiracles are placed on the sides of the dorsum, and in this respect recall the parasitic triungulin of the Meloid larvæ. The mandibles are barely corneous, and they are more elongate and curved in the younger than in the older larva, while the legs are also relatively stouter, more curved, and with a much longer and sharper claw in the younger larva, which seems well fitted for grasping the hairs of its host.

There can no longer be any doubt, therefore, about the true position of Platypsyllus. The eggs will probably be found attached in some way to the hairs of the animal they are laid on, much as they are in Mallophaga, and the pupa is probably formed in the nests of the host and not upon the skin, which will explain the reason for its not occurring with the larva and imago upon the beaver, either in the case of my specimens or those of Dr. Horn.

The greatest resemblance of Platypsyllus in the imago state to the Mallophaga is found in the spinous comb on the hind border of the occiput, the arrangement of the spines on the abdomen, and the superficial antennal structure, but particularly in the broad trilobed mentum. All of the other characteristics are readily referable to the Coleoptera, though, as Le Conte pointed out, they are composite, recalling in the antennæ, the Gyrinidæ, in the pronotum the Silphidæ, in the mesosternum Limulodes, in the elytra the Staphylindæ, in the legs the Anisotomidæ, and in the mandibles the Corylophidæ. The scutellum and the five-jointed tarsi at once remove it from Mallophaga, and it is a wonder that Le Conte and Horn have not more fully insisted on this fact. The trophi are very complicated, and there are various details of structure not noticed or not mentioned by any of the writers upon the subject hitherto.

I have been led to very carefully examine the imago, and the more closely I have done so, the more completely I realize the accuracy of

Le Conte's original work. The mandibles are visible or not, according as they are exposed or withdrawn, and their existence may depend on the sex, as, so far as my material justifies conclusion, they are visible in the male only. Where found, they correspond to Le Conte's description. Even in the larva they are weak and of doubtful service in mastication, while in the imago they are, as is also the labrum, quite rudimentary; which fact hardly justifies us, however, in arguing their non-existence.

As confirmatory of the affinities of Platypsyllus, as here proved, it may be mentioned that *Leptinus testaceus* Müll., the only species of its genus, is known to be parasitic on mice, as it has been found upon them in Philadelphia by Dr. John A. Ryder, and I have taken it in the nests of a common field mouse near Washington; but still more interesting is the fact that *Leptinillus validus* Horn (also the only species of its genus) is an associate parasite of Platypsyllus on the beaver, a number of both having been taken by one of my agents, Mr. A. Koebele, in San Francisco, from beaver skins brought from Alaska.

In reference to the classificatory value that should be attached to an aberrant type like this I have already expressed my opinion in a paper on Megathymus, a Lepidopteron that connects in many ways the two great divisions of butterflies and moths, published in the Transactions of the Academy of Sciences of Saint Louis, Volume III, 1876, and will take the liberty of reading a few passages therefrom:

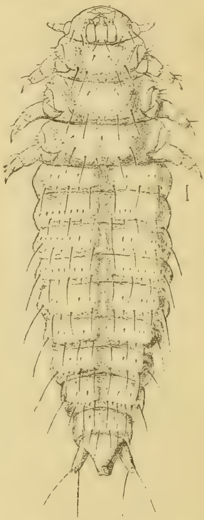

FIG. 70.—Full-grown larva from below—greatly enlarged (after Riley).

Between all classificatory divisions, from variety to kingdom, the separating lines we draw get more and more broken in proportion as our knowledge of forms, past and present, increases. Every step in advance toward a true conception of the relations of animals brings the different groups closer together, until at last we perceive an almost continuous chain. Even the older naturalists had an appreciation of this fact. Linnæus's noted dictum, "*Natura saltus non facit*," implied it; and Kirby and Spence justly observe that "it appears to be the opinion of most modern physiologists that the series of affinities in nature is a concatenation or continuous series; and that though an hiatus is here and there observable, this has been caused either by the annihilation of some original group or species, or that the objects required to fill it up are still in existence but have not yet been discovered."

Modern naturalists find in this more or less gradual blending their strongest arguments in favor of community of descent; and speculation as to the origin, or outcome rather, in the near present or remote past, of existing forms is naturally and very generally indulged, even by those who a few years back were more inclined to ridicule than accept Darwinian doctrine. Shall we then say that the old divisions must be discarded because not absolute? As well might we argue for the abolition of the four seasons because they differ with the latitude, or because they gradually blend into each other. Entomologists will always speak of moths and butterflies, howsoever

arbitrary the groups may come to be looked upon, or however numerous the intermediate gradations.

Families should, I think, be made as comprehensive as possible, and not unduly multiplied; and in considering aberrant forms, the objects of classification are best subserved by retaining them in whatever division can claim the balance of characters. It is better to widen than to restrict in the higher groups. Le Conte does better service in bringing Platypsylla among the Coleoptera than does Westwood in creating a new order—Achreioptera—for it. Phylloxera, in Homoptera, is much more wisely retained in the Aphididæ than made the type of a new family.

Platypsyllus, therefore, is a good Coleopteron, and in all the characters in which it so strongly approaches the Mallophaga it offers merely an illustration of modification due to food habit and environment. In this particular it is, however, of very great interest as one of the most striking illustrations we have of variation in similar lines through the influence of purely external or dynamical conditions, and where genetic connection and heredity play no part whatever. It is at the same time interesting because of its synthetic characteristics, being evidently an ancient type from which we get a very good idea of the connection in the past of some of the present well-defined orders of insects.

Westwood, though now an octogenarian, may safely be called England's most eminent entomologist by virtue of the character and volume of the work which he has accomplished. Dr. Le Conte was *facile princeps*, America's leading coleopterist. I do not know that any greater tribute could be added to the sound judgment and deep knowledge possessed by that late distinguished member of the Academy than the confirmation of his views as opposed to the views of Westwood and other European authorities which the discovery of this larva now gives us.

STRIDULATION IN VANESSA ANTIOPA.

By A. H. Swinton, Bedford, England.

Although the sound made by this butterfly without doubt is the expression of certain emotions, be it of anger or of love, since it is not made by the emission of the breath, we can not, I think, consider it more than elementary voice, and in the present instance a singularly erratic development of its elements. It may be that

> "In Loraine ther notis be
> Full swetir than in this contre,"

for English entomologists are, I believe, generally of opinion that the sound which butterflies make is caused by their rubbing their wings together in their ardor. In the *Entomologist's Monthly Magazine* for February, 1877, page 208, I find the following notice:

> In 1872 a female *antiopa* came into my possession in a hibernating condition, and in that state she would, when disturbed, partially expand her wings, and at the same time was produced a grating sound, which seemed to come from the base of the wings.—A. H. Jones, Shrublands, Eltham.

The *V. antiopa* is only a migrant to this country and seldom seen, but it breeds in Europe and northern Asia, commonly along willow-bordered streams. I have a few specimens from the banks of the Po, and from one of these I have detached the fore wing. (See Fig. 71.)

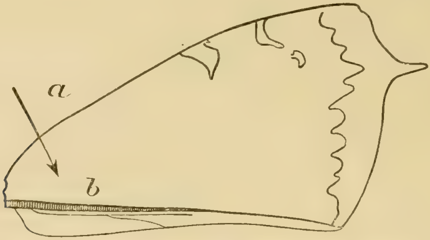

FIG. 71.—Diagram of fore wing of *Vanessa antiopa* (original).

Along the hinder edge of this I notice a smooth projecting vein, *b*, to run, which looked at in the direction, *a*, is seen with a strong magnifier to be flattened and notched like a file for not quite half its length. This vein, when the wings are expanded, rests on another projecting vein on the hinder wing, in such a manner that when the upper wing is moved the notched vein rubs over this vein as the bow rubbed with rosin works on the violin string.

Let any one now take a dried specimen of this butterfly from the cabinet and grasping the fore wing by its front edge rub it backwards and forwards over the hinder one, so that the bases meet, but being at the same time careful not to crumple the wings and so produce a false sound. He will then without fail hear the sweet secrets of *antiopa*, which are beautiful and delicate in expression, recalling the trickle of the brooklet.

I may notice that the *Vanessa* butterflies are renowned and well-known as stridulators on account of their large size, but that nearly all butterflies rub their wings together when under the influence of the emotion of love, and since it is the result of friction to produce a striated surface, many of these smaller ones must have organs of sound too fine for human sense. My own researches have always been circumscribed from a want of adequate microscopic power.

NOTES ON THE TENACITY, ELASTICITY, AND DUCTILITY OF RAW SILK.

By Philip Walker.

The tenacity of a silk filament is that property by virtue of which it resists rupture when stretched. Its ductility is the property which permits it to stretch without rupture; and its elasticity the virtue which enables it, after stretching, to recover to a certain extent its initial length. In ordinary parlance the tenacity of a silk thread is the weight, in grams, necessary to produce rupture. In determining the tenacity the force is generally exerted on a thread 50 centimeters long.

The properties of elasticity and ductility come into play simultaneously in the operation of stretching.

This fact was first determined by M. Robinet,* a Frenchman, who in 1838, and for ten years following, devoted himself to this and similar subjects with great advantage to sericultural science.

Thirty years later the subject was again attacked by M. Persoz,† of the Paris conditioning house, and at about the same time by M. Paul Francezon, of Alais (Gard). I owe to them a large part of the information contained in these notes.

If a thread a meter long is suspended from a fixed point, and to the lower end a weight is attached so as to stretch it 50 millimeters, this stretch will, upon the removal of the weight, diminish to about 35 millimeters. This 15 millimeters of recovery represents the elasticity of the filament and the 35 the ductility under the tension of the weight employed. If, on the other hand, we stretch it still farther, the proportion of ductility becomes greater and of elasticity less, until at between 15 and 20 per cent. (usually) the limit is passed and the filament breaks.

When the stretch approaches the limit of elasticity the recovery is very slow in a dry atmosphere, but more rapid in the presence of moisture. Thus, a thread 50 centimeters long, stretched 5 centimeters, or 10 per cent., when relieved of its load, recovered at once 25 millimeters; in the first half hour this increased to 3 centimeters. It was then moistened, and immediately recovered another half centimeter; during the following minute it shortened until but 1 centimeter of stretch remained and then the recovery stopped.

But although there is evidently a very distinct action of elasticity and ductility in the stretching of a silk thread, it is found sufficient in the commercial testing of raw silk to examine their joint action and to determine the total stretch of which a given thread is capable without breaking.

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* *Mémoire sur la Filature de la Soie*, Paris, 1839, and a series of memoirs published from 1843 to 1848, which are unfortunately not in the library of the Department.

† *Essai sur le Titrage et le Décrensage de la Soie*, Persoz, Paris, 1878.

Through some unexplained misconception, this per cent. of stretch is called the elasticity, though it were more properly styled the ductility of the thread. Adopting, however, the consecrated usage, we shall continue in these notes to use the term "elasticity" with this significance.

The elasticity of silk in its normal state is, as has been stated, from 15 per cent. to 20 per cent. Many conditions, however, may vary these results within and even beyond these limits. One of the most important of them is the amount of water contained in the silk. By the term "normal state" I mean about the same as by "conditioned weight;" that is to say, its state in an atmosphere of moderate dryness.

As an instance of the above I may cite the example of a thread which in the normal state had rather less than the average elasticity, that is to say, 14.7 per cent., which when thoroughly moistened only broke when elongated 19.4 per cent.

Among the more accurate of experiments on this subject are those of M. Persoz. They may be summarized as follows:

The presence of an excess of water in the silk exercises a notable effect on its elasticity, and (according to this author) on its tenacity, increasing the former and decreasing the latter. On the other hand, silk reduced to absolute dryness loses slightly in tenacity, but very considerably in elasticity. This is shown from the following experiment upon a 1.62 gram* white reeled silk:

Description.	Tenacity.	Elasticity.
	Grams.	*Per cent.*
(1) Thread soaked in water for twenty-four hours	115	22.3
(2) Thread in its normal condition	132	19
(3) Thread dried at 128° C	127	8.2
(4) Boiled off	102	14.2

It will be seen that between Nos. 2 and 3 the tenacity has diminished 3.8 per cent., and the ductility 56.8 per cent., and that between Nos. 2 and 1 the ductility has increased 17.4 per cent.

M. Francezon, who enjoys the reputation of being, from a scientific point of view, the most talented silk reeler in France, has also made exhaustive experiments on the elasticity and tenacity of silk, and his conclusions are in some points different from those of MM. Robinet and Persoz. Unfortunately, I have not been able to obtain his writings and therefore am forced to derive my information of his work from secondary sources.†

M. Francezon so improved the use of the serimeter as to compare, with entire precision, silks differing in size and in hygrometric condition. To evaluate the hygrometric condition during these tests, the skein to

* That is to say, a silk weighing 1.62 grams per 500 meters. The weight in grams of a skein of this length is the international standard for the sizing of silk adopted by the congress of Brussels.—P. W.

† Maillot—*Leçons sur le Vers á Soie de Murier*, p. 205.

be tested was wound upon a reel 1.250^{m} in perimeter and then cut exactly into two equal parts; one of these halves was weighed at once, and again after drying (absolutely), which gave the conditioned weight sought, as well as the quantity of water contained before the tests; the other half served in part for the tests and what remained was weighed as it was, and again after drying, which gave the weight of water contained after the tests; the mean obtained from these weights was taken as the average "hygrometric condition."

As a result of these experiments M. Francezon differs from both the authors already quoted by concluding that humidity has no effect on the tenacity. In relation to the elasticity, however, he has found where the silk contains not less than 8 per cent. and not more than 11 per cent. of water a variation of 1 per cent. of moisture more or less will occasion a variation of elasticity in the same direction of about 10 millimeters, (or 2 per cent.). His tests were made on first quality yellow French and green Japanese silks.

The presence or absence of gluten (*grès*) in silk has an appreciable effect on its tenacity and ductility. In the above table the loss of tenacity between No. 1 and No. 4 is 22.7 per cent., and of ductility 25.3 per cent. But in other tests these figures have reached 30 per cent. for the tenacity and 45 per cent. for the ductility.

In the matter of the charge of silk thread, it may be said that those substances which coat the fibrine, such as albumen and gelatine and its own gluten, probably increase the tenacity, while of those which penetrate and dilate the fibrine, some coloring matters are without effect, and others, such as the metallic salts, used to excess in producing black dyes, reduce the tenacity materially, and often entirely, so as to cause the tissue woven of it to crack when folded.

Aside from these extraneous influences upon the elasticity and tenacity of silk, there are others inherent in the silk itself, such as the volume of the thread and the number of filaments of which it is composed.

The tenacity of silks is not proportional to their size. The tenacity of silks composed of the same number of threads augments with their volume but by decreasing differences; in other words, all conditions being equal, the finer silk is proportionately stronger and its tenacity greater.

The tenacity of silks composed of increasing numbers of filaments increases in a proportion more rapid than the increase in the volume of the silks; in other words, the tenacity augments by increasing differences in a series of silks composed of increasing numbers of filaments.

For a given size the strongest silk is that into the composition of which enter the greater number of filaments. In other words, if two silks have the same size, while one is composed of four filaments and the other of five, it is the last which is the stronger and has the greater tenacity. The tenacity in composite silks increases proportionately with the number of contacts between the filaments.

The mean tenacity of silk for a thread of one square millimeter cross-section is 43.620 K. (95 pounds). *

* For demonstration see Maillot "*Leçons,*" etc., page 204.

In silks composed of the same number of filaments the relative ductility is not proportional to the volume. In the same silks the absolute ductility increases in a proportion which is very small when compared with the increase in the volume.

In silks composed of increasing numbers of filaments the elongation is not in proportion to the volume. In the same silks the relative ductility is almost in an inverse proportion to the volumes. In the same silks the absolute ductility augments to a certain degree with the number of filaments. These augmentations of ductility are successive and show a certain degree of regularity.

The volumes being equal, that silk is the most ductile into the composition of which enter the greatest number of filaments. In other words, given two silks of the same size, if there are five filaments in one and six in the other the latter will be the most ductile.

Therefore, although augmentation in volume in silks composed of the same number of filaments has an almost insensible influence on their ductility, an increase in the number of filaments increases the ductility to a considerable degree. This effect of the solidarity of the filaments is, however, very different for the ductility and the tenacity. The solidarity causes the tenacity to increase in a greater proportion than the increase in the number of filaments, while the ductility does not by any means increase in this proportion.

The general conclusion which is naturally presented to the mind after having thought over the facts recorded above is that silk is a much more homogeneous matter than was thought at first. The race of the worms, the climate, the nature of the food,* nothing, in fact, appears to sensibly alter its composition and its essential properties.

Whether it comes from the North or the South, from a feeble or a robust worm, whether it be white or yellow, fine or coarse, brilliant or dull, we find the same composition, the same proportional strength, the same elasticity. This all depends, however, on one condition—that all the samples examined shall have been reeled under the same conditions.

Some of the influences which have been thought powerful and capable of profoundly altering the essential properties of silk are almost powerless. Such are the age of the cocoons or of the reeled silk, the nature of the reeling-water and its temperature. On the other hand, it seems demonstrated that the processes and the mechanisms which have the effect of augmenting the tension of the silk thread during its development may alter it in an essential manner, above all its extensibility.†

EXTRACTS FROM CORRESPONDENCE.

Borers in a traveling Trunk.

On pages 258–262, Annual Report Commissioner of Agriculture, 1885, just received, you deal with the Leather Beetle. Possibly the following which at the time was a revelation to me may also interest you. In September, 1866, I bought a fine solid Russia-leather trunk in St. Petersburg. The price did not seem high. It had an additional outside linen cover, and I never noticed any sign of gnawing by insects. It was traveling with me until January 7, 1867; then quiet in my paternal trunk-room in New York until May, 1867; then with me in Washington until May, 1868; then with me in the old Cincinnati Observatory, Mount Adam, Cincinnati, until November, 1870. During these last two years I believe that I did not use it or move it from

* No food but the mulberry was used. It remains to be seen if the Maclura will give different results.—P. W.

† These last paragraphs are quoted by M. Persoz from the second of a series of memoirs published by M. Robinet between 1843 and 1848.

the store-room, where, however, it was in a good light and not near any old leather. Yet when I opened it to use it in October, 1870, it was riddled with holes and the beetles or furry-covered grubs were everywhere. I concluded that one or more must have been in it from the beginning unperceived and were thus imported from Russia, as I had never heard of such bugs in this country. I had bought the trunk under the impression that the peculiar odor of the Russia leather would repel moths and insects, but I was thus undeceived. The burrows were worse in the leather, but there were enough in the linen and especially in the wood, a hard hickory, to show that the beetle or grub was omnivorous. The trunk has long since gone to the old junk shop, but the bugs will remain, as they seem to have gotten into the carpets and house generally. I trouble you with this to ask organization and laws to prevent the importation of foreign injurious insects just as for diseases, paupers, etc.—[Cleveland Abbe, Washington, D. C., November 4, 1886.

NOTE.—We attempted at the time to secure specimens of this insect in order to determine it, but Professor Abbe was unable to furnish them.

An early Note on the Periodical Cicada.

In the *Western Monthly Magazine*, No. XXI, September, 1834, published at Cincinnati, I find a note on the Periodical Cicada which seems not to have come under your observation. It is in the form of an extract from the first number of "The Advocate of Science and the Annals of Natural History," published in Philadelphia, and reads as follows:

"The year of its appearance, however, varies in different sections of the country. In 1792, according to Barton, it visited the neighborhood of Elizabethtown, N. J., and had certainly appeared there three times before, at regular intervals of seventeen years. In 1797 it appeared in some parts of the State of New York. In 1800 it visited most of the Southern and Middle States. It is known to have observed the period of seventeen years in this extensive section of country, both before and since that time. In the middle and western portions of the State of North Carolina it appeared in 1803."—[S. A. Forbes, Champaign, Ill., May 8, 1888.

More Evidence bearing on Spider Bites.

Having seen a statement, taken from the Saint Louis Globe-Democrat, in regard to your investigating a case of spider-bite in North Carolina, I thought it might perhaps be of interest to you to give a statement of a case which occurred in my family at Augusta, Woodruff County, Ark., in the summer of 1870.

My little son, then about sixteen months of age, ran his finger into the key-hole of the front door, and uttered a scream. I took him away, but could see no cause for his continued screaming. I then thrust a stick in the key-hole, and a black or brown spider, with a bright red spot either upon the back of the head or upon its back, ran out. We put or bound common baking soda upon the finger, when he seemed to be relieved, and I went to the court-house, as I was holding my court at the time. But before time to adjourn court my wife sent me word that the boy was in spasms. We called in our doctor, and he claimed he had never known or heard of such a case, and seemed to doubt that the trouble was thus caused; by giving a powerful cathartic the boy was relieved of his spasms, but he died in less than a year of dysentery, and we always felt that the spider-bite led to his death, as it seemed he never recovered from the effects.—[A. D. Blanchard, Oneonta, N. Y., March 8, 1889.

Buffalo Gnats on the Red River.

I wish to call your attention to the fact that train-oil, or any kind of fish-oil, is an absolute preventive against the attack of Buffalo Gnats when applied in very small quanties to work animals. I have experimented with tar water and other remedies recommended in Report for 1886, and find nothing to compare with the cheap train-

oil. Many people are not satisfied to use the simple oil, but insist upon mixing tar and other useless things with it, which disfigure the animal by causing the hair to come off. Almost every one in this neighborhood is now acquainted with this remedy, but it may be well for me to direct your attention to it for future reference. We own about two hundred mules, and our lands extend from the margin of Wallace Lake along that of Cannisnia and Edwards Lakes for the distance of 20 miles, where this gnat breeds in vast numbers at this season of the year. We never had any serious experience with these gnats until the spring of 1885, when we lost fifteen mules in one week. At that time we were ignorant of the danger of their bites or the remedies against them, and treated the mules for colic, as they swelled up and showed every symptom of that disease. Since that time the gnats have come in swarms every spring about this date. I attribute this to the fact that a raft of some 10 or 12 miles has accumulated in Bayou Pierre, opposite to our possessions, which makes a perfect breeding place for them. The Government is responsible for this raft, as all the logs which were removed from the raft above Shreveport were directed by their engineer, Major Woodruff, into Jones Bayou, for the purpose of closing that stream.—[G. A. Frierson, Frierson's Mill, De Soto Parish, La., March 11, 1889.

REPLY.—I beg to acknowledge the receipt of your interesting letter of March 11 and to thank you for the information which it contains. We have come to practically the same conclusion in regard to the superior efficacy of fish-oil for Buffalo Gnat bites. The conditions which you describe regarding the accumulation of logs in Bayou Pierre are very favorable to the increase of the gnat, and I have no doubt that you are right in attributing the abundance of these pests to the Government operations.—[March 18, 1889.]

A Beetle living in an Insecticide.

Some two or three years ago samples of various substances used for insecticides were placed in the Agricultural Museum of Purdue University, at La Fayette, Ind. As the object was merely to display the substances, they were placed in the glass flasks, such as are used for similar displays of seeds, the mouth being in the base when the flask is in an upright position. One of these flasks contained several ounces of powdered white hellebore, which, as it was never disturbed, had settled into a somewhat compact body. On removing this flask a few days since the cork stopper was found to have been burrowed through, evidently from without, and the mass of powder was literally full of burrows and channels passing through it in all directions. On turning the powder out upon a table and examining it carefully two adult beetles of *Tenebrioides mauritanica* were found dead in the burrows in the powder. How long these beetles had remained in the powder alive it is obviously impossible to state; but it would be safe to say that they entered it from motives of choice, and either subsisted upon it or else did an incredible amount of tunneling without sustenance. While at the time the beetles were removed from the powder the latter was not fresh and did not retain its full strength, there still remained enough to impart a tingling, burning sensation to the nostrils when any of the powder was inhaled through the nose, yet not enough to set one to sneezing.—[F. M. Webster, Purdue University, La Fayette, Ind., December 23, 1887.

The new Flour Moth in England.

We have a flour caterpillar in England—newly arrived, in the last two years—which is so very troublesome and injurious where it establishes itself, that I should like to place a short account of it in your hands, hoping that at your leisure (I should rather say at your best convenience, for leisure you have none) you may kindly tell me whether you have it in the United States, and if so whether you manage to keep it in check. The caterpillars were first observed in Europe in 1877, by Dr. Jul. Kuhn, of Halle, doing much mischief in the process of grinding some American wheat. The imagos from

these larvæ were placed by Dr. Kuhn in the hands of Professor Zeller, who considered them to be *Ephestia*, of a species previously undescribed, and they were named by him *kuhniella* specifically, after their observer. All this most likely you know well, but it is the appearance of this pest here which I am more particularly writing to you about. In 1887 the caterpillars did great harm in some large stores in London, and last year the attack established itself in a wheat-flour steam-mill in the north of England. The great harm caused is by reason of the caterpillars "felting" up the meal or flour by the quantity of web which they spin in it. They feed of course, but this is not so injurious as working up the flour together, as they clog the mill apparatus to a very serious extent.

I have much reduced their numbers by getting the manager of the steam-mill to turn on scalding steam; and cleaning, whitewashing, and some use of paraffine have done good. The real cure would be to change the material ground. If we could use rye-meal for a few weeks we could clean out this wheat-flour feeding caterpillar effectually. Unfortunately, however, the delicate apparatus of our recently arranged wheat-roller mills does not allow of this. One point that would help us in preventive measures would be to know where the attack comes from. I am told it is a "scourge" amongst the flour—or rather the meal, as it prefers the more branny parts—in wheat from Russia and Hungary at the Mediterranean ports, so I am making inquiries, but Dr. Lindeman is not aware of this attack having been noticed in Russia. Under these circumstances I thought that I would write to you about it, and if you are acquainted with this moth and the larval workings—still more if you know how to destroy it—I should feel greatly favored and obliged by any information that you may kindly give. I believe that unless it has very recently been placed on your American lists of Lepidoptera it is not noted as known there, and I am trying to persuade myself that it is not all selfishness which makes me trouble you thus, but that, if by any possibility you may not chance to have heard of the serious nature of the work of these larvæ, you may care to have a few lines about them.

The moth is about three-fourths of an inch in spread of the fore wings, which are of pale gray with darker transverse markings; the hinder wings remarkable for their whitish semi-transparency, with a darker line from the point along a part of the fore edge. The larvæ when full grown, as far as I see, are about five-eighths of an inch long and palish flesh color, lighter when older, head yellowish-brown—you will not care to have full description—but they have surprising instinct for traveling, and amazing strength. One that I watched to test this power escaped from under a little smooth-edged card-board frame which I had placed on a woolen cloth on a quite flat table and pressed down with a 1-pound weight.—[Eleanor A. Ormerod, Torrington House, St. Albans, England, March 6, 1889.

REPLY.—Your letter of March 6 in reference to *Ephestia kuhniella* has just come. I am familiar with the substance of your letter, as I have read the papers by Mr. Klein in the Transactions of the Entomological Society of London, 1887, and in the *Mark Lane Express;* by Mr. Tutt in *The Entomologist*, and by Mr. Barrett in the *Entomologist's Monthly Magazine.* I think I can safely say that this species does not occur in the United States. Our *Ephestia* which has similar habits is the *interpunctella* of Zeller (*zeæ* Fitch). Fitch's account is published in his Second Report on the Noxious, Beneficial, and other Insects of New York, under the name of *Tinea zeæ.* He calls it the "Indian Meal Moth," "Indian meal" being the American name for the meal of maize. It will be a very difficult pest to fight and the measures which you have already adopted are probably the best which can be suggested.—[March 22, 1889.]

Abundance of an Iulus in Dakota.

Inclosed please find samples of a destructive and very annoying insect. I do not know its name; it is not poisonous. They first invaded us in September, coming in countless numbers in the yard, then in the house, and in everything they could find to eat. They have a special liking for sweet milk, pies, sauces, etc. When digging

potatoes I found as high as one hundred and fifty-three in the shell of one potato that they had hollowed out. While assorting potatoes a few days ago I found many alive; also what I believe to be deposits of their ova. By informing me of the name of the insect you will greatly oblige many farmers and gardeners.—[W. S. Young, Woonsocket, Dak., March 1, 1889.

REPLY.—I beg to acknowledge the receipt of yours of the 1st instant and the worms sent in the accompanying box. They belong to one of the common Western species of "thousand-legs," and judging as nearly as I can from the crushed specimens received they are the *Iulus virgatus* of Wood. Your account of the extraordinary abundance of this insect is very interesting, and I have seldom heard of a similar case. Your only plan will be to attempt to trap them on a large scale by placing slices of potato poisoned with Paris green in spots where they are most abundant. This course will occupy considerable time and will be quite troublesome, but it is the best recommendation I can make. If you adopt this plan please let us know of its success.—[March 18, 1889.]

The Bean Weevil in California.

At a meeting of our Horticultural Society held to-day, Mr. O. N. Cadwell exhibited specimens of beans from his place in Carpinteria showing the ravages of an insect new to us, and I have taken the liberty of sending you a few of the beans with the insects for you to identify. Mr. Cadwell thinks they were introduced in the "Golden Wax" bean during 1887, but he does not remember where they came from. The insect is discovered while the beans are yet in the pod and just beginning to ripen. They attack the "Limas" and all other varieties as far as observed. As the raising of "Lima" beans is an important industry with growers in the Carpinteria Valley, they are naturally nervous about this new enemy. I have no doubt you are familiar with the pest and can enlighten us about it. * * *—[H. C. Ford, Santa Barbara, Cal., February 6, 1889.

REPLY.—Your letter of February 6, with specimens, has been received. The insect which is damaging beans at Carpinteria is the common Bean Weevil (*Bruchus obsoletus*). It will not be necessary for me to write you at length concerning this insect, as Mr. Matthew Cooke in his work on the "Insects of the Orchard and Vineyard" has compiled a short account of it from my writings, accompanied by figures, upon page 334, under the name of *Bruchus fabæ*.—[February 18, 1889.]

Method of mounting Eggs of Insects for progressive embryologic Study.

* * * I mail you to-day a slide of newly hatched larvæ of *Arctia virgo*. * * * Possibly you may be interested in the method I use in observing the development of the embryo, which is simple and consumes but little time, though probably used by others, although devised by myself. In summer evenings, when moths fly into the house I capture them, placing each in a pasteboard pill-box three-fourths of an inch deep and 1 inch in diameter, marking the cover with a reference letter and, under this letter, entering in a record-book date of capture. If a female, I usually find next morning a number of eggs, which I distribute equally into a number of homeopathic phials each about 1 inch high, placing the same reference letter on the corks and numbering the corks from 1 upwards. Then I fill No. 1 with carbolic acid on the first day; No. 2 on the second, and so on until the last day I fill a bottle containing the newly hatched larvæ. I find the acid renders the eggs perfectly transparent, so that the embryo can be observed in various stages of development. I mount in benzole balsam direct from the carbolic acid, the larvæ sent you being prepared by this process. * * *—[Edwin A. Hill, Cincinnati, Indianapolis, Saint Louis and Chicago Railway Company, Cincinnati, Ohio, March 4, 1889.

Grass Cut Worms.

I send you by this mail three specimens of the worm, or grub, that is doing great injury to lawns in this city. I have not heard of them elsewhere. Although somewhat familiar with the habits of the worm, having seen it work in other States, I do not know its name. It works immediately under the ground, feeding entirely on the roots. It appears to move in a body, and the first indication of their appearance is dead grass, and the sod in such places to the depth of nearly one-fourth of an inch can be rolled up. What is the remedy, and must lawns so destroyed be plowed up? My investigation so far convinces me that the grubs or cut-worms destroy the sod entirely, and in that case re-seeding seems to be the only alternative. You will greatly oblige me by giving me a report for publication in the Northwestern Farmer.—[E. A. Webb, Fargo, Dak., June 30, 1888.

REPLY.— * * * Your box on receipt was found to contain three cut-worms, one of which had been destroyed by the other two. The remaining two belonged to entirely different species. The whitish worm with a brown head is the so-called Glassy Cut-worm (*Hadena devastatrix*) which was treated in the Annual Report of this Department for 1886, on pages 578 to 580, as injuring timothy in Indiana. The larger darker worm with dark stripes is the so-called Bronzy Cut-worm (*Nephelodes violans*). This worm was curiously enough found working with the Glassy Cut-worm in Indiana as mentioned in the article above referred to. It has been known to entomologists for a long time, but has seldom done any particular damage. If you have the 1886 Report at hand you will see that the damage done is almost precisely similar to that which you describe. It is altogether likely that the main perpetrator of the damage is the Glassy Cut-worm. The course to be pursued will depend upon circumstances to some extent. As soon as the damage is noticed, and it will probably be confined to a definitely limited spot, this spot should be inclosed within a furrow and the worms killed as they collect. Moreover, if the spot is small I would try drenching it with a dilute emulsion, as this course has been found to be effective against the white grub which works in lawns in a somewhat similar way. If, however, a large lawn has been neglected until it is almost entirely destroyed, it might as well be plowed up at once and chickens and hogs turned in to feed upon the worms.—[July 6, 1888.]

Another Proposition in regard to Chinch Bug Remedies.

I have lately discovered a remedy by which the Chinch Bug trouble may be greatly diminished, if the idea can only be brought before the farmers generally and induce them to act accordingly. I hope you will give the plan your recommendation, and have it published in the leading agricultural papers, and get the attention of farmers drawn to the subject as much as possible. The following is the plan given in brief:

That each farmer sow a small field of rye in the fall for early spring pasture; they should turn stock on it in the spring as soon as the bugs commence flying, which is towards the last of March or first of April; keep it pretty well grazed until nearly time for the young bug to hatch out, which is about the 20th of May. Then it should be all plowed under, leaving nothing for the young bugs to eat when they are hatched out. The Chinch Bug wants nothing to eat while in the egg state; but soon after being hatched they must go to eating, and can't travel far before eating their first meal—only a few feet at the farthest and they are done. That these things are facts and also that the grazing will draw the bugs to the field I have the most positive evidence, and might relate the circumstances by which I came to find it out. But not wishing to bother you with so long a letter I omit it. I will give it yet in another letter if desired, as it might give others a chance to experiment and find out still more on the subject. My plan will certainly commend itself to farmers as a saving, by drawing the bugs *from* their pastures instead of *to* them. If the bugs are numerous, as they were here this spring, it will not do to put the rye-field that has been plowed under in corn unless very late, for by that very mistake I am now losing my corn crop.

Some may not like my plan on account of losing the use of the rye field the rest of the season; but it might be put in such things as tobacco or potatoes that Chinch Bugs do not eat; and better lose it entirely for the season than lose a crop as some of us are now doing in this vicinity. I do not claim that all the bugs will lay their eggs in the grazed rye-field and none in the wheat; but I do claim the grazing will draw them and vastly diminish the evil.—[David M. Scribner, Hickman's Mills, Jackson County, Mo., July 7, 1888.

Two Chinch Bug Appearances the past Year.

* * * You asked me to give you a history of the Chinch Bug in this locality. * * * They appear on the small grain, wheat and oats, in May, and when that crop has been harvested they go into the corn. They sometimes totally ruin a large field of wheat or oats, and I have seen as much as one acre in one place wherein they killed every stalk of the corn after it had silked and tasseled. They must lay from two hundred to five hundred eggs each, and in three weeks from the time the eggs are laid the bugs are grown or capable of doing as much damage as they will ever do. I have seen more than one million on a place 60 feet square. They acquire wings at four or five weeks old and fly away, but they always leave a host behind them, which stay until frost. I find plowing the corn as often as possible the best means of checking them, as by that means a great many of the eggs are covered up and the smaller bugs killed. Light, sandy lands are not troubled with them after June 1, as they make their way into the earth in the middle of the day, and the sand gets so warm by about June 1 that they can not live in it. They do most damage on clay and slaty lands, and stay with us in winter by hiding themselves in rotten wood, boards, old stumps, and on rough stubble lands. A bug called the Lady-bug is thought by some to be connected with them in some way, as they invariably go before the Chinch Bug. The Lady-bug is a red-speckled insect about the size of a small field pea, and the Chinch Bug is smaller than the smallest grain of wheat. In their first stage they are red, in the second stage black, and in the third stage they acquire wings of a whitish color and then they fly away from one place to another and deposit more eggs.—[J. F. Myers, Chesterfield, S. C., June 22, 1888.

I have the honor to inform you that the Chinch Bug is now putting in an appearance, locally only, so far, but very numerous. Barley, of which there is but little grown, however, is destroyed almost completely, and the bug is attacking some corn fields. Wheat is too far along to be damaged by them. The 17-year locust has also appeared, but confines its ravages to the woods so far. We do not anticipate any trouble from them.—[Paul Lachmund, Sauk City, Wis., July 9, 1888.

The Texas Heel-fly.

I will as soon as possible send you some specimens of screw-worms. If the fly will deposit her eggs in pieces of meat there will be no trouble, but I am told she does not do this. You appear to have misunderstood my letter in regard to the Heel-fly. I thought I stated plainly that the fly did not directly injure the animal. The injury is the result of the annoyance caused the animal. A cow will be quietly grazing, when suddenly she will spring forward, throw up her tail and make for the nearest water at a headlong gait, seemingly deprived for the moment of every instinct except the desire to escape, so that they will rush over a high bluff, if in their way, often being killed by the fall. This, with miring in water holes and the fact that they are prevented from feeding, causes the loss. The fly may appear any time after the last of December whenever we have a few warm days, and will remain until May if the weather is such that comparatively cool days occasionally alternate with warm, but once the weather becomes settled, they disappear. I can find no one who has ever seen any larvæ in the heel. That they attack the heel seems certain from the fact that the animal is satisfied the moment it reaches even shallow water. It has been

described to me as resembling the nit-fly or bee which deposits its eggs on the hair of horses. I shall forward specimens as soon as possible.—[George Wolf Holstein, Box 45, Albany, Texas, February 14, 1888.

REPLY.—* * * I have now for nearly three years been aware of the fact that the Heel-fly is a distinct and well-known species, and that it really lays its eggs upon the heels of cattle. It is closely allied to the Warble-fly of the Ox (*Hypoderma bovis*), belonging in fact to the same genus, and in general appearance it resembles this species very closely. It is the *Hypoderma linearis* of Villers. This determination has been corroborated by our best American authority upon Diptera, Dr. Williston, of New Haven, and the specimens were received from Mr. W. F. M. Dickson, of Milford, Texas. You are right in saying that the fly will not deposit her eggs in a piece of meat or in a raw spot on the animal. The eggs are unquestionably laid near the heel among the hair, and my desire is now to get hold of authentic specimens of the larvæ or maggots. The very fact that cattle fear this fly so terribly, and run to mud and water to cover their feet and legs, indicates that the attack is exclusively in the vicinity of the heel. I shall be very glad to get further specimens of the fly, and if the maggots or grubs, or larvæ can be obtained they will be of the greatest value. The Screw-worm of which you speak is the *Lucilia macellaria*, and this insect is well known to oviposit only upon raw places, such as open wounds.—[February 28, 1888.]

Insect Injuries in Ohio for 1888.

In looking through my berry patch I found that nearly every raspberry cane had been stung by the Snowy Tree-cricket (*Œcanthus niveus*). So abundant were they that the canes were very seriously injured. * * * I found one cane 22 inches long which contained three hundred and twenty-six eggs by actual count. In another I counted fifty eggs in a little less than an inch. This fall they seem fully as abundant and do not confine their depredations to raspberry alone, but have used the tender shoots of some plum grafts which I had in my nursery, and these are nearly ruined; they are decidedly on the increase with us and will have to be dealt with very severely in order to check their ravages.

Another pest which seems on the increase is the Grape-vine Leaf-hopper (*Erythroneura vitis* Haw.). In 1888 and the present year they have been very abundant, eating the leaves and causing the foliage to look very brown. There is also a leaf-miner which works in grape leaves, nearly every leaf having one or more of their paths in them. I have not reared the insect, so can not describe it.

The Hog Caterpillar (*Philampelus vitis* Haw.) and another (*Thyreus abbottii*) were very abundant this season on the grape and Virginia creeper, but I could not find a single one of either species that was not parasitized by a Microgaster.

The Grain Louse (*Aphis granarius*, Kirby) was very bad on oats this season, nearly every head being filled with them. This caused the oats to be light weight, and many straw stacks are green with the heads that were blown over in threshing.

There has also been an unusual abundance of the Currant Worm (*Nematus ventricosus*), the Rose Slug (*Selandria rosæ*), the Strawberry Emphytus (*Emphytus maculatus*), and above all the Cherry Slug. There was a row of the sour red cherry trees which were so badly infested with this pest that the trees looked as if they had been scorched with fire.

The Clover Root-borer has done great damage to clover, eating the tap-root and thus destroying the vitality of the plant. It was very wet during the month of October, and this caused branch roots to form which keeps the clover alive, but not in thriving condition. This is destined to be one of our greatest pests, and from all appearances it has come to stay.

The Cabbage Worm (*Pieris rapæ*) and the Potato Beetle (*Doryphora 10-lineata*) were not any more abundant than usual, and with proper care were kept in subjection.—[W. B. Hall, Wakeman, Ohio, November 26, 1888.

A Boll-worm Letter.

Will you kindly send me the most recent printed matter on fighting the Cotton Boll-worm. We are establishing a branch of our station on one of the State farms in the Brazos River Bottom in the southern part of the State, where cotton grows 6 to 8 feet high, and where this pest will sometimes destroy 100 acres in a block. Will be glad to have you make suggestions in regard to undertaking the work.—[F. A. Gulley, Director State Experiment Station, College Station, Tex., March 27, 1889.

REPLY.—I beg to acknowledge the receipt of yours of the 27th ult. We have done no work here upon the Cotton Boll-worm since the publication of the Fourth Report of the U. S. Entomological Commission, a copy of which you doubtless possess. You will notice from this report that the principal practical remedies are the avoidance of corn crops in the immediate vicinity of cotton-fields; the early worming of neighboring corn; and above all the early poisoning of the cotton crop with Paris green or London purple, as for the Cotton Worm. Some extensive experiments are really needed, and you have a most excellent opportunity of testing particularly this last remedy. It is to a certain extent theoretical, although, as you will notice by the appendices of the Fourth Report, the experiments which have been tried upon a small scale indicate that it will be successful.—[April 1, 1889.]

A remarkable Theory.

Thirty years ago, while going my daily morning rounds to kill the millers that were troubling my honey bees, I found a common grasshopper with his skin cracked open on his back and with a cricket inside the grasshopper's skin. It produced a sensation with me, as I had supposed that the grasshopper and cricket belonged to different genera. I had no books to help me, so I went to work to study the grasshopper family. I soon satisfied myself that the cricket was a pupa. Then the question arose, what was the imago? I found that the flying grasshoppers made their appearance at the time the crickets left, and were full grown when they came and were more nearly like the crickets than the most of imagos are like the pupas from which they come. I satisfied myself that the crickets with their rear stylets could not mate if they wanted to. I ought to have added, for the week following my discovery of the grasshopper changing to a cricket, I saw from one to three in the same condition each day. After two years I found two crickets that had a burrow in my garden, which I resolved to watch. I commenced to work at them on the 10th of July. I went to look after them about every half hour. I watched two or three days and found a flying grasshopper at the mouth of the burrow. It was quite stupid, so that I could pick it up and lay it down. It took it two or three days to get life enough to attempt to fly or to get out of my way. It finally became active. At the time that I found this one I dug into the burrow to look after the other cricket, but it was not there. It had probably been caught by the fowls. But I found a cricket's skin, which was good enough proof to convince me that the cricket had changed to a flying grasshopper. In the printed slip I have given the rule. I will now give exceptions. The rule is given for the three largest species. Three times in the last thirty years, after a protracted season of dry, warm weather, I have seen the crickets of the smallest of the three species of grasshoppers on the 25th of August, otherwise I have not seen any before the end of the first week in September. Another exception is, that after a protracted season of cold, wet weather on bleak hills I have known the common grasshoppers to live over winter before changing to crickets. If you would like to experiment, I would send you a few flying grasshoppers, after they had mated and been fertilized, with the expectation that you could hatch their eggs and produce before spring a crop of crickets which would show all the stages of the insects.

About ten years after making my discovery I got Professor Tenney's "Zoology." I there saw the common grasshopper, the cricket, and the flying grasshopper described as three distinct genera. This produced another sensation, it being the first intima-

tion that I had had that my discovery was an original discovery. I then wrote a similar description to the inclosed printed slip, and sent a copy to Townend Glover, one to Dr. Fitch, and one to Professor Tenney, and asked a criticism from each. I did not get a response from either. Commissioner Watts responded by saying that I was mistaken in supposing that the grasshopper laid eggs and then changed to a cricket. He then gave me the version which I already had in Mr. Tenneys' book. I replied by showing how he had mistaken my statement. That ended that correspondence. Some three years ago I got hold of our State Entomologist's report and read it with a good deal of interest. I then took the liberty of rehearsing my discovery as in this communication, and was told in response that I was mistaken in my deductions, saying that it was not possible for the cricket to change to a flying grasshopper, but that the common grasshopper might. I had made no deductions to be mistaken in. I had simply stated what I had seen. My feeling was that if he was a gentleman he had a queer way of showing it. Our correspondence closed. If it is impertinent for me to try to get a discovery that I have made in natural history before the world, I am unwittingly and unintentionally guilty. Hoping that you will find nothing offensive in this communication, I will subscribe myself with kind regards.—[Archibald Stone, Binghamton, N. Y., August 27, 1888.

REPLY.—I am sorry to have to tell you that you have certainly been deceived. You may have found a cricket which had crawled inside a cast skin of a grasshopper, but for the one insect to pass into the other and back again is utterly impossible. You will soon be convinced of this if you will confine one of the insects in a jar or breeding-cage and watch it closely, and see that no other insect has access to the jar. This must be, I think, the way in which you were misled. In watching those in the burrow out of doors and not confined, it was a very easy matter for the insects to get mixed up. Crickets and grasshoppers belong to two entirely distinct families, and so you will at once see the fallacy of supposing one to proceed from the other. In regard to the imagos of crickets, they mate, in spite of their rear stylets, which you will find if you observe them closely.

The young grasshopper has a sort of a general resemblance to a cricket, and after it hatches from the egg it molts periodically, each time the wings becoming more marked until the final molt leaves it with fully developed wings. The specimen will be found to be in a weak condition after each molt, especially the last one. So it is just possible that you have made a mistake in the *identification* of crickets. The specimens which you observed and accepted as crickets may have been the larvæ of the grasshoppers, in which case you have followed the stages correctly. I shall be pleased to receive specimens from you both of the crickets and the grasshoppers, which will at once settle the question.—[August 30, 1888.]

[Printed slip inclosed by Mr. Stone.]

GRASSHOPPERS AND CRICKETS—SEVERAL STAGES OF INSECT LIFE.

BINGHAMTON, *August* 25.

To the Editor of the Republican:

I gave notice in the daily *Republican* on the 10th of July last that in the next ten days all the crickets would change to flying grasshoppers. I will now give notice that all the common grasshoppers will change in the next three weeks to crickets. That the reader will not be confused, I will say that the common grasshopper hatches out of very small eggs about the 1st of June. They eat and grow until about the end of the first week in September, when within the next two weeks they change to crickets. The crickets remain as crickets through the winter and until the 10th of the following July, when they change to flying grasshoppers. The flying grasshopper mates. They remain until October or November, when the females work their bodies down to their wings into the ground and die. Their eggs remain in the tips of their bodies, where they hatch the next spring, the offspring using the bodies of the mother flying grasshopper as a staircase through which to come to daylight.

In the life history of insects the eggs are the first section. The eating and growing section, known as the larva, is the second section. The intermediate section between the larva and the imago, known as the pupa, is the third section. The perfect insect is known as the imago. The whole growth of all insects is made by the larva. Neither the egg, the pupa, or the imago ever grow. Neither do either of the first three sections mate or lay eggs. The common grasshopper is the larva. It never mates or lays eggs. Its whole work is to eat and grow. The cricket never grows, neither does it ever mate or lay eggs. It is the pupa. The flying grasshopper is the imago. It never grows, but mates and lays the eggs. Any one wishing to become a witness to the change that is now to be made can put a box into his pasture where there are plenty of grasshoppers and go to it every morning before sunrise, after the first week in September or during the second week, and he may be quite sure of being gratified. The change of the cricket to the flying grasshopper is effected in the cricket's burrow in the ground and is not so easily witnessed.

ARCHIBALD STONE.

GENERAL NOTES.

LATE IMPORTANT PUBLICATIONS RELATIVE TO THE HESSIAN FLY.

E. A. Ormerod.—Hessian Fly. Report on insects injurious to wheat plants in New Zealand. (4 folio pages, dated April 11, 1888, with a figure of Howard's plow appended on fifth page.)

Karl Lindeman.—Ueber das Vorkommen der Hessenfliege an wildwachsenden Gra'sern. (Entom. Nachr. XIV, No. 16, Aug., 1888, p. 242–243.)

S. A. Forbes.—A new parasite of the Hessian Fly. (*Psyche*, Vol. V, No. 144, April 1888, p. 39–40.)

Fred. Enock.—Parasites of the Hessian Fly. (The Entomologist, Vol. XXI, Aug., 1888, p. 202–203.)

In the above-named articles, which were published within a few months of each other during 1888, several interesting points and new facts in the natural history of the Hessian Fly have been brought out.

After a careful comparison of imagos and upon examination of infested wheat straws, both received from New Zealand, Miss Ormerod declares that the New Zealand insect is indistinguishable from the genuine *Cecidomyia destructor*. This sudden appearance of the Hessian Fly in such a remote part of the globe, coming so shortly after its appearance in England, can not fail to attract general attention. That the insect has been introduced into New Zealand can not, we think, well be disputed, and it is quite likely that such importation took place from England and not from North America. Miss Ormerod seems to have some doubts on this question, since she says:

> I notice a small point about the fly which inclines me to conjecture it is American.

At any rate a study of the parasites, which will no doubt be bred from the New Zealand fly, will definitely settle this question, as it was the case when the Hessian fly appeared in England. It will be remembered that an inspection of the parasites bred in England enabled us to decide that the Hessian fly must have been introduced into England not from North America but from Russia.

Our knowledge of the parasites of the Hessian Fly has been advanced by two contributions: Professor Forbes describes a Proctotrupid (*Platygaster hiemalis*), which he bred from puparia collected in southern Illinois in March. The parasites issued on unknown dates between April 23 and October 18.

Mr. Fred. Enock gives a list of the parasites which he bred in 1887 from the puparia of the Hessian Fly. They are ten in all, three corresponding to American species, five to Russian species, and two undetermined. We are quite certain that the determination of two of the American species is incorrect, but this question we shall discuss elsewhere.

Another interesting and very important question, economically, has been touched upon by Professor Lindeman, viz, that of food-plants of the Hessian Fly other than the cultivated cereals. He first mentions the finding in England of a single pupal case of the fly on velvet grass (*Holcus lanatus*) as recorded by Charles Whitehead in 1887. In June of the same year Dr. Lindeman found in the neighborhood of Moscow two stalks of timothy (*Phlœum pratense*) infested with larvæ of the Hessian Fly; and in June of the year following, 1888, he received information of the injurious abundance of the fly on timothy in the Government of Tambow, together with a large number of pupæ, which he says were undoubtedly those of the insect in question. In 1887, also, he received from Tambow and Woronesh specimens of "quick grass" (*Triticum repens*) containing pupæ of *Cecidomyia destructor*.

Dr. Lindeman thinks there can be no doubt but that under certain conditions, such as the absence or scarcity of the ordinary food-plant, the Hessian Fly may subsist on various wild or cultivated grasses. He makes no mention, however, of having reared the adult flies, which leaves the matter of the correct identification of the insect in some doubt. In view of the importance of this question, further observations are highly desirable.

FUNGICIDES AS INSECTICIDES.

We have elsewhere referred to the fact that Colonel Pearson, of New Jersey, discovered that the lime and copper sulphate solutions used against the Grape Mildew were also efficacious against the Rose Bug, and our attention has been called by a note in the *Rural New Yorker* for March 23, 1889, to the effect that F. Bascarolli, a grape-grower in the Tyrol, shows that this same substance is very injurious to locusts and to garden snails.

KEROSENE-SOAP EMULSION AS FUEL.

It is stated that Dr. Kauffman, a Russian experimenter, has succeeded in solidifying petroleum to be used as fuel, by heating it and mixing it with from 1 to 3 per cent. of soap. The latter dissolves in the oil, and the liquid in cooling forms a compact mass having the appearance of

cement and the consistence of tallow. The product is difficult to inflame, but when lighted burns slowly and without smoke, developing a high temperature, and leaving only 2 per cent. of a hard black residuum. —[*Engineering*, July 27, 1888.

NEW FOOD-PLANT FOR THE SCURFY BARK-LOUSE.

Mr. John R. Matlack, of Fort Washington, Pa., sent us specimens of currant twigs of the "cherry-currant variety" completely covered with female scales of *Chionaspis furfurus* Fitch. He also wrote that all the branches were covered in a similar way. This appearance of this scale upon Currant was to be expected, but was not previously recorded. The food-plants previously known are as follows: Apple, Pear, Choke-cherry, Crabapple, European Mountain Ash, and Black Cherry.

OBITUARY.

We are much pained to learn of the death of Samuel Lowell Elliott, Ph. D., which occurred at his residence in Brooklyn February 12. Dr. Elliott was forty-five years of age at the time of his death and had for a long time been well known as a careful student of the habits of insects, and was a remarkably ingenious man in the way of contriving successful methods of rearing and studying living insects. He was born in Plattsburgh, N. Y., and was the only son of Dr. W. H. Elliott, of that village. He was a member of a number of scientific societies, among others the Entomological Society of Washington.

PRECURSORS OF BROOD VIII OF THE PERIODICAL CICADA.

Prof. William A. Buckhout informs us, under date of February 23, that three adult Cicadas appeared in his greenhouse during the last week. The greenhouse was built about eighteen months ago and its site was formerly covered by an irregular growth of nursery stock.

A SPIDER-EGG PARASITE.

Mr. Henry C. Wells, of Short Hills, N. J., sends us, February 24, a cocoon of the common *Argiope riparia* from which had issued three female specimens of the Ichneumon, *Pimpla inquisitor*, which we had previously bred from a number of Lepidopterous larvæ. The *Argiope* cocoon was full of the cocoons of the parasite. As many as twenty could be plainly counted. They were about 10 millimeters long by 3 millimeters in diameter, and were composed of rather loose pure white silk, closely covered with the loose reddish-brown silk of the spider. The spider eggs had been entirely consumed and only slight traces of them remained.

SPRAYING FRUIT TREES.

The testimony of experimenters is not entirely in favor of this remedy. Mr. W. A. Smith, of Berrien County, Michigan, reports in *Popular*

Gardening for March, 1889, that he sprayed his apple trees once last year and that nine-tenths of the fruit were wormy. No particulars are given, but the instance is worthy of record.

It is but fair to state, however, that Mr. Smith also states that for the last two years he has found that a single spraying saved his cherries, and also that four or five applications have done the same for his plums.

WHITE GRUB IN STRAWBERRY BEDS.

Mr. M. T. Thompson (*Popular Gardening*, March, 1889) finds that plenty of manure and thorough working of the land will greatly reduce the numbers of the white grub. He understands that hog manure will not answer the purpose.

FARMERS AND STOCK-RAISERS' INSECT SOCIETY.

We learn that a meeting of farmers and stock-raisers was recently held at Duquoin, Ill., intended primarily to take some action regarding the Chinch Bug and also to form an organization for the study of the habits and the best means of fighting insect pests in general, where concerted action seemed to be needed. Mr. E. M. Harris, of Duquoin, was elected president, and a board of directors was chosen composed of one farmer from each of the eight precincts of the county. County organizations of this kind are most desirable, as they will bring about a concert of action which can not be arrived at in any other way.

A BRYOBIA IN NEW ZEALAND.

In our March number we published a communication by Mr. Webster concerning a mite of the genus Bryobia, which has been infesting houses in Indiana and other parts of the country. We learn from the *New Zealand Farmer* for February that a congeneric insect is damaging the leaves of the apple in New Zealand.

THE BOX ELDER BUG.

In Bulletin No. 12 of this Division we published an account of damage to apples by *Leptocoris trivittata* in Utah, and stated that our correspondent wrote " that they had appeared upon the box elder shade trees." During the past season we have heard of their occurrence in great numbers in Utah and Nebraska, and notice in the Kansas *Industrialist*, for March, 1889, an article by Prof. E. A. Popenoe, in which he figures the insect in all of its stages and gives an account of its habits. He has observed it feeding upon a number of plants, but upon none of much economic importance.

THE FLORIDA WAX-SCALE IN CALIFORNIA.

We have recently received a letter from Mr. W. E. Collins, the Secretary of the Board of Horticultural Commissioners, of San Bernardino

County, Cal., inclosing us specimens of a scale insect which were taken from trees imported this season from Florida, and which prove to be the well-known Wax-scale of Florida (*Ceroplastes floridensis*). It has not previously been reported from the State of California, and Mr. Collins writes that the specimens are the first of the kind that have been seen in San Bernardino County. Up to the present time the species has been supposed to be confined to the State of Florida, where its principal food plant is the Gall-berry (*Ilex glabra*), a plant which grows wild in the flat woods and in low grounds about ponds. It also lives and thrives upon Quince, Apple, and Pear, and occurs everywhere upon the Orange, but usually in insignificant numbers. It is not noted as a pest in Florida, but occasionally it will increase upon an individual tree so as to arouse apprehension. It is readily killed by the kerosene emulsion spray, which should be applied while the majority of the insects are young.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

March 7, 1889.—Judge Lawrence Johnson presented a paper on the "Jigger-flea of Florida," giving an account of its life-habits, and the damage which it causes to young poultry. The best preventives are cleanliness and keeping the young chickens away from dry, dusty places that are protected from rain.

Professor Riley spoke of some Microgasters affecting Rhopalocera, dwelling upon the great variability of the species and the difficulty of finding specific characters. He considers the sculpture, especially of the scutellum, as affording the best character. He identifies *Microgaster pieridis* Pack. as *Apanteles glomeratus*, although the American form differs in the leg coloration.

Mr. Marlatt read a paper on *Lycæna comyntas*, referring to an immense swarm of these butterflies noticed flying about an elm tree at Manhattan, Kansas. Other instances of the swarming of butterflies were mentioned in the discussion.

April 4, 1889.—Mr. M. L. Linell was elected an active member, and notice was given that the third number of the Proceedings had been issued. A letter was read from Baron C. R. Osten-Sacken, inclosing a note for publication entitled "Correction to the Monographs of the Diptera of North America, No. 1, Washington, 1862."

Dr. Marx read a paper called "Some spiders from the Galapagos Islands." This paper was based on the collection made by the scientific force of the steamer *Albatross*, and nearly all of the spiders were new. This paper gave rise to a discussion on the value of insular faunæ in the light of the theory of evolution.

Mr. Schwarz read a paper on "Vitality of Insects in Cold Water." His observations were made on the shores of Lake Superior, where, under certain conditions, immense numbers of insects are sometimes washed ashore. He explained this phenomenon, and presented a tabular statement of the condition of insects of different families.

Mr. Howard presented a note on the "Mouth parts of the Cockroach," describing in detail these parts and calling attention to a formerly unnoticed sclerite.

WILLIAM H. FOX, M. D.,
Recording Secretary.

PERSONNEL OF THOSE ENGAGED IN GOVERNMENT ENTOMOLOGICAL WORK.

The following list embraces those now engaged in Government entomological work, and who will assist in the management of the periodical: those at Washington editorially, and the others as contributors. The force of the Division of Entomology is more or less inconstant, as it consists of both permanent and temporary employés:

DIVISION OF ENTOMOLOGY, U. S. DEPARTMENT OF AGRICULTURE.

Entomologist: C. V. Riley.

Office Staff: L. O. Howard, First Assistant; E. A. Schwarz, Th. Pergande, Tyler Townsend, C. L. Marlatt, Assistants; Philip Walker, Assistant in silk-culture and in charge of reeling experiments.

Field Agents: Saml. Henshaw, Boston, Mass.; F. M. Webster, La Fayette, Ind.: Herbert Osborn, Ames, Iowa; N. W. McLain, Hinsdale, Ill; Mary E. Murtfeldt, Kirkwood, Mo.; Lawrence Bruner, Lincoln, Nebr.; D. W. Coquillett, Los Angeles, Cal.; Albert Koebele, Alameda, Cal.

DEPARTMENT OF INSECTS, U. S. NATIONAL MUSEUM.

Honorary Curator: C. V. Riley.
Aid: Martin L. Linell.

☞ For bibliographical purposes it may be necessary to state that, where expedient, the names or initials of members of the force will be attached to their communications. Where initials alone are appended, the full name can be ascertained by referring to the list above given.

Editorial or unsigned articles or notes should be credited to "INSECT LIFE," or where it is desired to give personal credit, to "Riley and Howard." While most of the correspondence of the Division is carried on by myself, yet much of it is also attended to by my first assistant, Mr. Howard, who acts as Entomologist in charge during my absence, and otherwise so materially assists in editorial and office work that only those articles signed by either should be considered individual. Illustrations, where not otherwise stated, are drawn by Miss Lillie Sullivan, under supervision.—C. V. R.

U. S. DEPARTMENT OF AGRICULTURE.
DIVISION OF ENTOMOLOGY.
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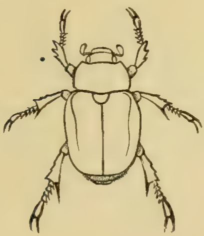
INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS.



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SPECIAL NOTES.

Australian Enemies of Icerya in California.—Mr. Koebele writes under date of April 4 that he has just visited Los Angeles, and finds that many of the Australian Lady-birds have escaped from the tent in which they were confined and have made themselves at home on the neighboring trees, where he found not only numerous eggs but also nearly full-grown larvæ. Within the tent they were swarming in great numbers, eggs, larvæ, pupæ, and beetles. The Lestophonus seems to be developing very slowly; only young larvæ were found within the scales, yet many were infested.

We have just received, through the kindness of the author, the second edition of Saunders' Insects Injurious to Fruits. The volume is but two-thirds the thickness of the first edition, but, being printed on thinner paper, contains the same number of pages, and the price has been reduced from $3 to $2. In the preface to the second edition the author states that he has endeavored to make such corrections and embody such additional facts as will bring it into accord with our present knowledge of fruit enemies. We are sorry to notice, however, that some points are partially overlooked, or might with advantage have been a little more elaborated; but this is a matter of expense and is settled between author and publisher.

As a whole, the work is a most excellent compilation, and absolute errors are rare. We will call attention to two only. The one occurs on page 131, where it is stated that the application of Paris Green deters the Codling Moth from laying her eggs on the apple, and the other on page 400, in the statement that the adult female of *Icerya purchasi* is covered by an egg-sac.

The first edition appeared in 1883, published by J. B. Lippincott & Co.; the second edition, 1889, same publishers. As a compilation of matter of much value to fruit growers, interspersed with the author's own experience, this work serves an important purpose.

Catalogues of Oriental Insects.—Our esteemed correspondent in Bengal, Mr. E. T. Atkinson, C. G., Accountant-General of the Treasury at Calcutta, has undertaken the gigantic task of preparing catalogues of the Class Insecta belonging to the Oriental Region. It is intended to include therein all described species up to date. These catalogues will be of great use to workers everywhere. The first one, which embraces the Cicindelidæ, Mr. Atkinson writes us, under date of March 12, will appear in a few weeks.

A new Government Publication.—We have received the first number of the Journal of the Board of Viticulture, a publication just inaugurated by the Agricultural Department of the colony of Victoria, Australia. This first number is a small octavo of 80 pages and contains the minutes of the proceedings of the Board of Viticulture for Victoria, an account of a conference of vignerons, held in August, 1888; of a conference of fruit-growers held in September, 1888; a number of papers relating to vine-growing in California and the British colonies, and a notice of a proposed college of viticulture. The number contains considerable matter of interest to entomologists, and we notice that in the discussions it seems to be an accepted fact that the Grape-vine Phylloxera has obtained a hold in Australia. There is also the report of some discussions regarding the appointment of a qualified entomologist and of the introduction into Parliament of an insect pest act. The journal is to be published monthly at the expense of the government, provided the vine-growers show their interest in the matter by joining a central vine-growers' association, and subscribing to the association half a guinea annually.

NOTE ON THE GENUS LESTOPHONUS.*

By S. W. Williston, M. D., *New Haven, Conn.*

In the abstract of the Proceedings of the Linnæan Society of New South Wales for February 27 of the present year Mr. F. A. A. Skuse states that he has recognized two species in what I had erroneously considered one, and described, rather too briefly I may say, as *Lestophonus iceryæ*. He is also of the opinion "that the genus *Lestophonus* can be included in the family *Oscinidæ* only as an anomalous genus. Not only is the arista of the antennæ entirely wanting, and the anal cell

* This genus *Lestophonus*, it will be remembered, was erected by Dr. Williston in No. 1 of the current volume of Insect Life for the Australian parasite of *Icerya purchasi*—the Fluted Scale of California. It is the same parasite which Professor Riley has had imported into California in such numbers from Australia during the past winter months. The question of the identity of the form bred from Monophlœbus and that bred from Icerya is of extreme practical importance for the reason that owing to the comparative rarity of Icerya in Australia a large portion of the Lesto-

present, but a rudimentary auxiliary vein is visible and a pale posterior basal transverse vein exists."

Happening to be in Washington recently, I gladly availed myself of the opportunity to carefully examine all the material of this genus in the Department collection, which examination enables me to discuss more intelligently the character of both genus and species than was possible from the three not too well preserved specimens that I had previously studied. Mr. Skuse is quite right in considering the genus an anomalous member of the *Oscininæ*. My reasons for placing it there were chiefly neurational ones, to which, with Schiner, I am inclined to attach much importance. Notwithstanding Mr. Skuse's assertion I will repeat that the auxiliary and anterior basal cross-veins are entirely wanting, as Mr. Skuse will, I think, see by mounting specimens of the wings in balsam. By reflected light there does appear to be a rudiment of the

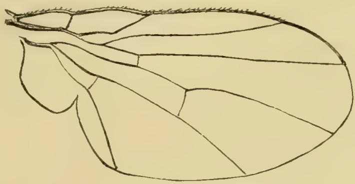


FIG. 72.—*Lestophonus iceryæ:* wing venation.

auxiliary vein, very similar to the fold seen in many species of *Oscininæ*, running forward from the humeral cross-vein and becoming obsolete. I am not sure what Mr. Skuse means by the statement that there is a pale posterior basal transverse vein. Such a vein is distinct, otherwise there would be no anal cell. If "posterior" is a lapsus for anterior, however, I must differ with him—the second basal and discal cells are wholly confluent. But, notwithstanding these peculiarities, which seem characteristic of the *Drosophilinæ* and *Oscininæ*, I believe now, after a more careful study of allied forms, that the relationship of the genus is with the *Ochthiphilinæ* of Schiner, somewhere in the vicinity of Leucopis. It is true that Loew's definition of the *Agromyzinæ* will wholly exclude this form, but so will it exclude other genera that Loew includes in this group—there are no vibrissæ, the front does not have strong bristles, and the anterior basal cross-vein is wanting; furthermore there are no bristles on the under side of the first femora, and the peculiar exserted genitalia are different; nevertheless I would place the genus provisionally here.

phoni imported were taken in Monophlœbus on the supposition that they were specifically identical with those infesting Icerya. The abstract of Mr. Skuse's paper was sent to Professor Riley by Mr. Frazer S. Crawford, and arrived after Professor Riley's departure for Europe in April. Fortunately Dr. Williston was in Washington at the time, and made a careful examination of all the material at the Department, and wrote this note at our request.—L. O. H.

As regards the specific differences, I can assure Mr. Skuse that there was but *one* species in the specimens I described, nor can I find satisfactory evidence of more than one in the material in the Department collection, including nearly fifty specimens. Nevertheless, I will by no means say there may not be two. In the examination of an abundance of fresh material, Mr. Skuse is in a far better position to discuss such characters than I am. That what was considered *L. iceryæ* was bred from both Icerya and Monophlœbus might lead one to suspect two forms, but would not be a strong evidence in itself. The same species is frequently parasitic on different, sometimes numerous, hosts. The specimens examined were bred from both Icerya and Monophlœbus.

There is a minute variation in the shape of the antennæ. In many specimens the third joint is rounded on the distal end, in others subangulated in front below, almost as figured. The face, when the antennæ are removed, shows two subantennal grooves, separated by a low ridge and reaching to the oral margin. The size of the shining frontal triangle is a little variable; on either side the opaque orbital triangle may be somewhat reduced in size. Along the vertical margin of the occiput there is a row of short delicate bristles. In the thorax, abdomen, or wings I can discover no differences, except minor colorational ones. The feet, in specimens that I suspect are immature, are yellow, whereas in others they are luteous or even darker. None of these differences would I consider other than varietal in the absence of better evidence.

A matter of greater interest at present is the geographical distribution of the genus and the validity of the present generic name.

So far as the material at my command permits I feel better satisfied with the species than with the genus. In my search for the genus I overlooked Rondani's description of Cryptochœtum, Rondani (Bull. Soc. Ent. Ital., 1875, 172), to which my attention was called later by Mik's suggestion of the relationship. The characters, as given by the author, though not very complete, apply well, as will be seen. Still, as the name is already proposed, it will be premature to withdraw Lestophonus until we have further information of Cryptochœtum. Especially would I call attention to the peculiar genitalia here figured, no reference to which is made by Rondani, though he knew both sexes.

FIG. 73.—*Lestophonus iceryæ*: male genitalia.

His generic description is as follows:

Cryptochœtum.

Antennæ articulo ultimo latissimo et ad epistomium elongato, præsertim maris maximo, subquadrato, arista in utroque sexu abortiva, indistincta—Oculi nudi—Frons puberula, non setosa.

Alæ margine antico non secto; vena costali ad apicem tantum tertiæ longitudinalis, non ad quartam producta; areola basali antica incompleta; vena ultima postica exilis sed distincta. Femora omnia non incrassata.

Sp. *C. grandicornis.* Raro in floribus Euonimi europei, in collibus subapenninis ditionis parmensis eum legi.

THE CORN WORM OR BOLL WORM IN CALIFORNIA.

By D. W. COQUILLETT, *Los Angeles, Cal.*

In the Fourth Report of the United States Entomological Commission, pages 355 to 384, Professor Riley has given an exhaustive account of the Corn Worm or Boll Worm (*Heliothis armigera* Hübner). During my residence in California I have made a few observations upon this insect not recorded in the above report.

While the normal habit of the full-grown larva is to enter the earth to pupate it does not always follow this course. On the 9th of October I found three chrysalids of this species in ears of corn, and on the 8th of the succeeding month I found a fourth chrysalis in a similar situation. On the 7th of November a moth issued from one of the chrysalids first mentioned, so there is no doubt of the identity of the species.

Besides garden geraniums I have also found the larvæ feeding upon the blossoms of a wild sunflower (*Helianthus* sp?) and upon the seed-pods of *Malva borealis*, as well as upon those of a leguminous plant commonly known as "bitter-clover," also upon the leaves of Cabbage, Grape, and Pear, and I found a half-grown larva feeding upon a green pear into which it had already eaten a large cavity. In the same tree were two other larvæ of this species.

In the work above mentioned Professor Riley records having bred from Boll Worms two species of *Tachina* flies—*T. aletiæ* Riley and *T. anonyma* Riley. On the 1st of June, 1888, several Tachinid larvæ issued from some of these worms, which I captured in Los Angeles, and soon afterward pupated; the flies issued on the 14th of the same month. Specimens of these flies were submitted to Professor Riley for identification, and under date of February 14 he writes me as follows concerning them:

> I have glanced at the *Tachina* from *Heliothis armigera* and find that it differs from *T. anonyma* and it does not seem to be represented in the Museum collection.

The species is an interesting one on account of the great difference in the arrangement of the bristles on the head and abdomen in the different sexes; so great, indeed, is this difference that no person not familiar with the facts in the case would ever suspect that the two forms are but the opposite sexes of the same species. That they are such, however, there can be no doubt, since I bred both forms from the same lot of larvæ and also captured three pairs united in coition. The species is evidently

new to science, and in order that it may be recognized in the future, I append the following detailed description of it:

Tachina (Masicera) armigera n. sp.

MALE.—*Front* narrow, scarcely half the transverse diameter of the eyes, frontal vitta blackish-brown, sides of front with yellowish cast, furnished with a single row of bristles, the upper three or four of which are well differentiated from the lower ones, the latter descending on sides of face a little below base of the third antennal joint. *Antennæ* black, second joint short, third joint narrow, of nearly an equal width, fully three times as long as the second; arista naked, thickened on its basal third. *Face* silvery gray, lateral margins less than half as wide as the median fovea, the lateral ridges with bristles extending nearly to lowermost of the frontal row, the vibrissal bristle a little above the epistomal margin. *Palpi* yellow. *Eyes* bare. *Mesonotum* gray pollinose, with four well-marked shining stripes. *Scutellum* black, gray pollinose, furnished with six marginal bristles, the pair at the apex stout, a pair of smaller ones in front of them. *Abdomen* elongate-ovate, black, mottled with gray, sides of second segment except narrow posterior borders, and sides of third except the posterior third, reddish, apex of last segment sometimes also reddish; first segment with a median posterior pair of bristles, second segment with three pairs, the intermediate ones poorly developed, third segment with two pairs and the usual posterior row, fourth segment and lateral margins with the usual bristles, remaining vestiture of abdomen composed of quite long, recumbent bristles, but the abdomen can not be said to be hirsute. *Legs* black, bristly, front tibiæ with a pair of apical bristles and with a single one on outer side below the middle, hind tibiæ feebly ciliated, pulvilli and ungues elongated. *Wings* grayish hyaline, outer posterior angle of first posterior cell rounded, destitute of a fold continuation of the fourth vein.

FEMALE.—Differs from above description of the ♂ only as follows: *Front* broad, equaling transverse diameter of the eyes; crown with two additional bristles outside of those in frontal row. *Antennæ* with third joint less than three times as long as the second. *Abdomen* grayish-black, first-segment and posterior end of the second and third clearer black, sides of second and third segments concolorous with rest of abdomen; dorsum of abdomen with no bristles except a posterior pair on the third segment, those at apex of the last one and on the lateral margins. Length 6 to 8^{mm}.

Described from 2 ♂ and 3 ♀ bred from *Heliothis armigera* Hüb. at Los Angeles, Cal., and 9 ♂ and 3 ♀ captured at the same place, three pairs captured while united in coition.

Professor Riley, to whom I am indebted for a revision of the above description, writes me as follows concerning the generic position of the above species:

This species, in the elongate antennæ, with the short second joint, and the absence of the fold of the fourth vein, belongs more properly with *Masicera*, but the more elongate abdomen and the differences in the width of the female and male fronts are characters of the true *Tachina* (*sens. str.*). As the two genera run so closely into each other it may be as well for the present to locate it with *Tachina*.

THE SERIMETER.

By Philip Walker.

The first experiments, having in view the determination of the fact that silk is elastic, were made near Paris in 1836. They were executed by MM. Delbare, sr., Paroissien, and Boucher. Two years later, M. Robinet, "Member of the Royal Academy of Medicine and Professor of a course on the Silk Industry," took up the work and it occupied him for several years, during which he announced his results in a series of *memoires*. It is to be regretted that only the first of these, entitled a "Memoire on the Silk Filature," published in Paris in 1839, is at present in the library of the Agricultural Department, for it is, to this learned experimenter that we owe nearly all of the earlier knowledge of the physical properties of silk. He invented the serimeter, the instrument employed in determining the tenacity and elasticity of raw silk. The perfected form of this machine, as used by him, is shown in Fig. 74. It was the outcome of several tentative models described in the memoire cited. The principle of these was one by which a very light cup was suspended to the thread to be tested. This cup carried a pointer which glided along a scale. The silk in place, the cup was gradually filled with sand, the addition stopping only with the rupture of the thread. This apparatus only measured the elasticity.

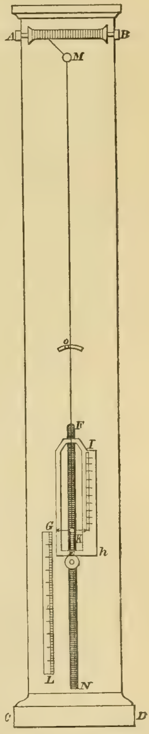


Fig. 74.—Robinet's Serimeter.

After having obtained, by means of the apparatus of the cup and sand, a certain number of results which demonstrated that silks had, to very different degrees, the faculty of stretching, Robinet constructed a more accurate machine of a high degree of sensibility and capable of giving results that might be compared with one another. His first idea was to replace the uncertain and unequal descent of the cup charged with a variable weight by a fixed weight, the action of which would be moderated and regulated by means of a pendulum or balance-wheel absolutely like that of a clock. The silk was attached by one end to a fixed point; the other end was seized by a pair of pincers fastened to a weight which gave motion to a chain wound round the drum of the clock. Then by means of a very simple mechanism of an escapement and a balance-wheel the descent of the weight could be regulated so that each oscillation of the balance-wheel would make it descend one millimeter and stretch

the silk to that extent. This apparatus being completed, several interesting tests were made with it. Later a spring or dynamometer was attached to it on the upper end; this spring, which was extended by the silk attached to it, indicated the weight corresponding to the effort necessary to stretch the silk to the breaking point; it therefore gave the measurement of the tenacity. By means of a very simple arrangement the needles indicating the tenacity and the ductility remained fixed at the point in which they were when the silk broke.

It was, however, soon perceived that this apparatus, although already very satisfactory, was still capable of receiving several improvements, such as a fly-wheel in place of the escape-wheel, which would avoid the little jerks imparted to the silk by the latter. It appeared also possible to avoid certain corrections necessitated by the presence of the dynamometer which let the upper end of the silk descend slightly as it yielded to the effects of the weight. A more perfect instrument was then constructed, for the details of which M. Robinet gives credit to M. Lehodey, a clock-maker of Paris. This instrument he called the *serimeter* * because, as he naively says, "it was necessary to have a name for it to avoid paraphrases."

The construction of this serimeter is shown in Fig. 74: A B C D is a box one meter and a half long. At A B is a spindle on which can be placed a bobbin of the silk which we wish to test; M is a clip which grasps the silk and holds it firmly. K is another clip placed exactly one meter from the clip M. The clip K can slide in the groove N P made in the box, and is fastened, on the interior thereof, to a weight attached to an endless chain. The descent of this weight is made perfectly regular by passing the chain over a sprocket-wheel forming part of a clock-work.

As soon as the mechanism starts the weight decends, drawing the movable clip K towards N and stretching the silk which is fastened to it. At O there is a small and very light lever which rests against the stretched silk. At the moment when the latter breaks the lever acts on the fly-wheel of the mechanism, and stops it immediately. The needle G is attached to the clip K and indicates on the scale GL the number of centimeters and millimeters which the weight has descended and the silk been stretched.

The experimenters thus devised a method of determining the ductility of silk, which was found to be an excellent one when the instrument was well made, ran with perfect regularity, and did not jerk the silk in any way.

But it was not thought sufficient that the serimeter should give the measure of the ductility alone, it must also indicate the weight equivalent to the effort which caused the thread of silk to break; in other words, it must give the measure of the tenacity.

This desideratum was accomplished in the following manner: The

* Silk measurer.

clip K, instead of being fastened directly to the weight of the mechanism, was attached to it by means of a small spiral spring, E; the clip was drawn by the weight through the intermediation of this spiral spring. The weight acting on the spring at E, and the silk fixed in the clip K, resisting this action, the spring was stretched from E to F, and the double pointer G, being movable, was made to rise. The latter indicated on the scale *h i* the extension of the spring up to the moment when the silk broke; for then the spring resumed its original length and drew the clip with it; but the needle being free and drawn by friction only, remained in place and gave the double indication of the ductility and the tenacity, for the divisions of the scale *h i* indicated the number of grams corresponding to the effort necessary to stretch the spring.

Now, it will be observed that this scale was attached to the spring and descended with it, so that, whatever the stretch imparted to the silk, the point to which the spring was attached and its scale were always in the same relative conditions. For a better comprehension an example may be cited: A thread of raw silk is stretched upon the instrument; the mechanism is started; it stretches the silk 150^{mm} and the needle G indicates that figure on the scale GL. On the other hand the spring and its scale have followed the movement of the weight, but the resistance of the silk has stretched the spring and caused the needle to rise, relatively, to the 30-gram point. We have thus a silk of which the ductility is represented by the number 150 and the tenacity by the number 30.

If, now, instead of one thread we take two and fasten them in the clips, the effort of the weight will still stretch them 150^{mm}, but the double resistance which now opposes this effort will be found to have raised the needle to the 60-gram point. This is evident, and the result would have been the same if, instead of two threads, we had employed one having a double tenacity.

The experiment terminated, the clip K is drawn to its initial position by means of a button placed under the spring E.

Such was Robinet's perfected serimeter and its *modus operandi*. The standard serimeter of to-day differs from it, not in principle but in some mechanical details. That employed in the silk laboratory of this Department is shown in Fig. 75, and was constructed by Berthaud, of Lyons.

As in Robinet's second instrument, the dynamometer is on the superior portion of the apparatus at A. In it the spring has been discarded and the tension of the thread is exerted on a pendulum, *c*, which is raised more or less from its vertical position as the tenacity of the silk is greater or smaller. In its swing upward this pendulum carries the pointer *d*, which however does not return with it but is held up by the friction on its axis. This pointer slides along a quadrant on which is engraved a scale of grams, indicating the tenacity of the thread. But,

as the pendulum rises the clip *e*, which is indirectly attached to the bell crank at its upper end, descends. To indicate this descent the quadrant bears a second scale *b*, upon which the same pointer *d* shows the motion of *e* in millimeters. This motion must be deducted from the motion of the lower clip *f* to obtain the real stretch of the silk.

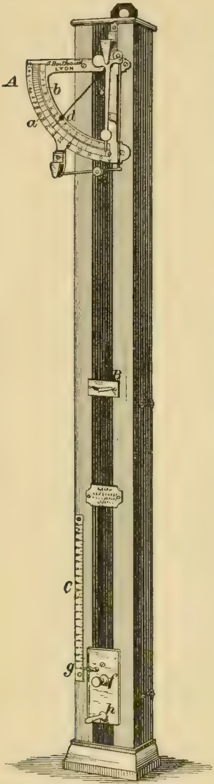


FIG. 75.—Standard Serimeter.

The lower portion of the instrument is similar to Robinet's apparatus minus the dynamometer. The clip *f* carries a pointer *g*, which indicates upon the scale *c* the amount of stretch at the moment of rupture. In the instrument of to-day, however, the distance between the initial position of the clips is but 50 centimeters, and as the scale is divided into centimeters and millimeters the stretch there indicated must be doubled to obtain the per cent. of elongation.

The instrument just described is that used in all conditioning houses to-day. There is, however, according to M. Quajat, Assistant Director of the Italian Experimental Station at Padua, a great difference among instruments in the time necessary for the descent of the weight from the upper to the lower end of the scale, a distance of 200^{mm}. In a recent pamphlet he calls attention to this fact, which is important because the indicated tenacity of a given thread may be altered by varying the time to which it is submitted to the strain. The weights of the serimeters in the following conditioning houses descend (according to M. Quajat) in the following periods of time:

	Seconds.
Milan	15
Turin	14½
Turin (another establishment)	13
Treviso	20
Padua	16
Lyons	16

That in the silk laboratory at this Department consumes thirteen seconds in the descent.

In relation to the instrument in the New York Silk Conditioning Works, the director of that institution writes:

In answer to your favor of the 17th instant, I beg to state that I have tested the serimeter used by us and find as follows: The average time it takes to run from zero to the 200 mark is fifteen seconds; after a thorough cleaning and when everything is favorable it takes twelve seconds, but after a few hours on account of dust the speed is reduced to fifteen seconds, and if very dusty I find as low speed as eighteen to twenty seconds.

This feature of cleanliness opens up a new objection to the present form of serimeter, emphasizing as it does the variability in the time necessary for the weights to descend in the different official serimeters of the world.

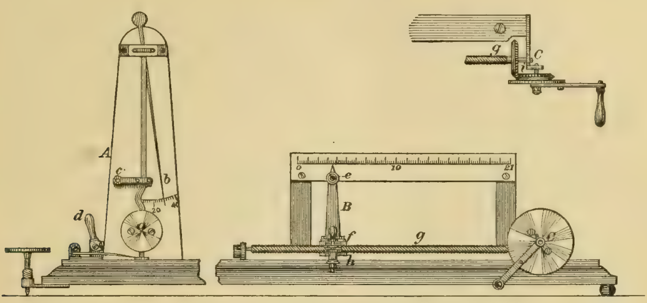


FIG. 76.—Quajat's Horizontal Serimeter.

Desiring therefore to construct a serimeter that would overcome this difficulty, M. Quajat has designed that shown in Fig. 76. This apparatus is horizontal instead of vertical as is usual. It is handier to use and the operator can employ it with less fatigue.

It is composed of two pieces placed upon a base which may be leveled by an adjusting screw. The piece *A* carries a pendulum *a* which draws with it in its movement the pointer *b* which, as in other dynamometers, marks on a quadrant the number of grams by which it has been displaced. To a small clip, *c*, is attached one end of the filament to be tested. This piece is so placed that its level will be as little disturbed as possible during the test. A small stop piece, *d*, holds the end of the pendulum at the zero of the scale and at the same time shows whether the apparatus is level.

On the piece *B* the second end of the filament is caught in the clip *e*, which is exactly 50 centimeters from the clip *c* when all the pointers are at zero. The pointer *f* runs along a scale divided into millimeters and shows exactly the distance which the thread has stretched when rupture takes place. The movement of the pointer is caused by means of a driving screw, *g*, which is turned by a crank which is connected to it through a pair of miter gears, and which has such a pitch that the movement of the hand will advance the pointer 10 millimeters per second. The nut *f* is so constructed that it may be detached by a single turn of the screw *h*, which throws it out of gear with the driving screw and enables us to bring it back to the zero point.*

The mode of compensation for the movement of the clip *c* is exceedingly simple, the pendulum being so adjusted that it will displace that

* This description is translated from the pamphlet already mentioned. The cut is also reproduced from it.

clip just 1 millimeter for each gram of tension exerted, and therefore the number of grams of tension is the same as the number of millimeters of displacement, and both are read from the same scale.

ADDITIONAL NOTE ON THE MEGILLA PARASITE.

By C. V. Riley.

Since the publication of our article on this subject (see p. 101, *ante*) we have received an interesting letter on the subject from Rev. T. A. Marshall, of England, who is monographing the Braconidæ, and to whom we sent specimens. He replies that the species belongs to the genus Dinocamptus of Foerster, which he himself prefers to regard as a subsection of the old genus Perilitus, and that the European species *P. terminatus* (formerly placed in Microctonus by Ratzeburg, Ruthe, and others), the habits of which are so similar to those of our American species, belongs to the same subsection of the genus. Concerning our own species Mr. Marshall writes:

It differs very little from the cognate European forms, and is interesting to know from your observations that it has similar habits. Its appearance confirms my notion that such a genus as Dinocamptus is useless and should be suppressed; for your insect exhibits at the same time the dividing nervure of Dinocamptus and the abruptly curved radial cell of Perilitus.

Using, therefore, the same specific name proposed in our former article, the species may be described as follows:

Perilitus americanus n. sp.

Female.—Length 3.5^{mm}; expanse 6^{mm}. Head nearly smooth, thorax and first abdominal segment punctate, abdomen glabrous. First cubital areolet separate from the first discoidal; radial areolet ending half way between the wing and the stigma, semi-cordate. Terebra straight. Color black; antennæ dark, pedicel and first funicle joint yellowish; head, except ocelli and included spot and the large occipital black spot, fulvous; middle and hind coxæ black, hind femora dusky, rest of legs honey-yellow; wings hyaline, stigma dark brown, veins a trifle lighter, still lighter in hind wings; most of abdomen dark fulvous approaching castaneous, dark on mediodorsal region.

Resembles the European *P. falciger* Ruthe in venation, but differs in shape of ovipositor and radically in coloration. Differs decidedly in color from the only described North American species—*P. mellinus* Provancher.

Since the preparation of this additional note Messrs. C. M. Weed and C. A. Hart have published in *Psyche*, for April, 1889, an article entitled "Notes on the Parasite of the Spotted Lady-beetle." The authors have found a number of similar cases and, adopting our name of *Centistes americana*, publish a full description of both sexes. They have therefore fallen into the same error of generic position, and their description seems to indicate that they had before them a different species of Perilitus, although on actual comparison of type specimens the differences may prove to be varietal.

William H. Patton calls our attention to the fact that Mr. Glover, in the Annual Report of the Department of Agriculture for 1877, figured upon Plate III (Fig. 43) a Lady-bird parasite which worked the same way, showing a grass leaf with the cocoon under it and the beetle clinging to the cocoon. The parasite itself is figured natural size from the side on the upper side of the leaf. In his text he refers to it in the following words (page 99):

A parasitic insect attacks the *Hippodamia* (*Coccinella*) *maculata* (Fig. 43), the Spotted Lady-bird, in a very similar manner, and was taken in Maryland.

NOTES UPON THE LONGEVITY OF THE EARLY STAGES OF EBURIA QUADRIMACULATA, Say.

By F. M. WEBSTER.

On June 28, 1888, Mr. J. N. Latta, of Haw Patch, Ind., sent me a crushed specimen of this beetle, with the statement that it had been found underneath the carpet in the parlor of Mr. J. R. Copeland, a farmer living near Wawaka, Ind. The carpet, as I afterward learned from the lady of the house, had been taken up and renovated regularly each spring for many years, but nothing of this sort had been noticed until the last time it was removed, when a number of beetles were found underneath, and both the floor and carpet badly eaten. Some weeks later, and after the floor had been thoroughly swept and the carpet had been replaced, another beetle of the same sort had been found crawling on the inside of one of the windows.

Further correspondence with Mr. Copeland revealed the following facts: The floor was composed of hard maple, and had been used in the building fourteen years before. The lumber had been sawed and had laid in the saw-mill for a considerable time prior to its having been used. The house had been constructed upon the present stone foundation, and two feet above the level of the ground. There was no way by which these insects could reach this floor (which by the way is the only one injured in the entire building) other than by way of the windows or by an outside cellar door, about 30 feet away, and leading through a dark alley, this parlor not being situated over the cellar. The room, being the parlor, was not much used and the windows were nearly always kept closed. The floor was not affected more seriously near the edges of the carpet than elsewhere, and the injury did not appear to have been influenced by light or proximity to the cellar door previously mentioned. In short, everything indicates that the eggs or larvæ were in the wood when used, fourteen years before.

APRIL 10, 1889.

EXTRACTS FROM CORRESPONDENCE.

Trumpet-creeper injured by Lygæus reclivatus.

Herewith I send you some specimens of an insect which has appeared in large numbers on a "trumpet-creeper" in this neighborhood. There are no signs of it on any other plant in the garden, but I am told it appears regularly on this one every autumn. I fail to find anything to indicate that these insects were hatched out on the vine, although they may possibly have come to life in the cracks in the wall behind it. I wish to know if it is injurious to vegetation, and whether it should be destroyed or encouraged.—[William Campbell, 328 East Fourth street, Salt Lake City, Utah, October 5, 1888.

REPLY.—The insect in question is one of the plant bugs known as *Lygæus reclivatus* Say. It injures vegetation by puncturing the twigs of plants and sucking the sap. It is found on a large variety of plants, and it is curious that they only affect in your neighborhood the trumpet-creeper.

If you desire a remedy you can do no better than to spray the plants with a dilute emulsion of kerosene and soap, made according to the following formula:

Kerosene	2 gallons	= 67 per cent.
Common soap, or whale-oil soap	½ pound	= 33 per cent.
Water	1 gallon	

Heat the solution of soap and add it boiling hot to the kerosene. Churn the mixture by means of a force-pump and spray-nozzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens on cooling, and should adhere without oiliness to the surface of glass. Dilute, before using, one part of the emulsion with nine parts of cold water. The above formula gives 3 gallons of emulsion, and makes when diluted 30 gallons of wash.—[October 9, 1888.]

Thrips tritici injuring Orange Blossoms.

Inclosed in the bottle which I send you are a lot of insects and orange flowers. These were taken from trees that were badly affected with what we call blight or wilt. The foliage appears as though it were terribly affected with the drought; sometimes the entire tree, but more frequently a few branches. The leaves will fill out during a rainfall, but soon wilt again when the weather becomes fair and cloudless. The foliage soon falls, the limbs becoming bare; the terminal twigs will then die, sometimes back to the body of the tree.—[Robert C. May, Rock Ledge, Fla., April 12, 1889.

REPLY.—The insects which you send, and which were found in the flowers of the orange, belong to the species known as *Thrips tritici*. It received this name from the fact that it was originally described from wheat. Upon orange, so far as we know, it is found principally in the blossoms; in fact, it inhabits all sweet-scented flowers. They appear to feed for the most part upon the stamens and petals, from which they suck the oil. These parts of the flower fall naturally, and the work of the *Thrips* only hastens their dropping. The fruit-producing pistil is usually left uninjured. Ordinarily, therefore, it can not be considered an enemy to the plant, although it may, when occurring in enormous numbers, do some damage. A solution of whale-oil soap in the proportion of 1 pound to 4 or 5 gallons of water will destroy the insects when sprayed upon the flowers in a fine spray.—[April 16, 1889.]

White Ants in Australia.

I am troubled with "White Ants" in my orchard. They are killing some of my fruit trees and vines. Can you in your next issue recommend any preventative or permanent cure that will not be too expensive? They appear to be a common pest

in the Goulburn Valley, and a cheap remedy would be of great service. I have heard of arsenic as being a remedy. Would it be safe to apply a handful of the poison around the roots? Would it be likely to injure the trees?—[George North, Numurkah, Victoria, Australia, January 21, 1889, to Charles O. Montrose, Editor *Victorian Farmers' Gazette*, Melbourne.

REPLY.—Regarding the letter from your correspondent in Numurka, who wishes a remedy for the damage done by White Ants to his fruit trees and vines, I may say that if his determination of the insect is correct he ought not to have much difficulty in remedying the damage, providing the habits are similar to those of similar insects in this country. In the orange groves of Florida considerable damage has sometimes been done by our common White Ant (*Termes flavipes*). We find it invariably attacks wood buried in or lying upon the ground and that its central nests are rarely discovered, but generally exist in deeply buried roots or under very large stumps and logs. The workers extend their subterranean galleries for immense distances and it is therefore practically impossible to trace them to a source and thus break up a colony.

They damage living trees by eating away the bark about the collar and root, and growing wood is only attacked by them under exceptional circumstances, when there is no dead wood or when they wish to escape from the heated soil. Recently transplanted trees or those planted too deep, or those which have too much earth heaped about the crown or are diseased from any cause, invite attack. Their work is readily distinguished by the fact that the walls of the galleries are always lined with a layer of comminuted wood which gives them a characteristic mottled appearance. Their entrance galleries are under the surface of the ground and under cover of other material, for they never expose themselves to light. The decaying stumps and roots of forest trees on newly cleared land form a source of supply and should be carefully and thoroughly removed from vineyards or fruit orchards. Mulches of decaying wood should not be heaped about the base of the tree. Wherever White Ant attack is suspected the earth should be removed from the affected parts and the ground should be exposed to the depth of several inches, and the dead wood and bark should be cut off with a knife. A liberal application of hot water will destroy those which can not be reached with the knife. Pyrethrum and kerosene emulsion in extremely diluted solution can be applied with success, but the latter should be used with great caution. Trees which have been girdled may be saved by inserting scions between the root below and the stock above, re-establishing the connection between the two. A poultice of mud and cow dung applied to the affected part will protect it and assist in the formation of new bark.—[April 15, 1889, to Mr. Chas. O. Montrose, 222 Russell street, Melbourne, Australia.]

The Toad vs. Cockroaches.

I have read your publication on "Insect Life" with much interest. The article in No. 3, page 67, on "Injury done by Roaches," etc., suggested to me to call your attention to a sentence in my book on "Quince Culture," page 133, where I say: "Poultry are supposed to omit from their bill of fare some of our insect friends, and it is probable the birds do likewise; but all insects are devoured by the toad, which will clear your room of cockroaches over night, just as he will your garden of the vilest of your insect foes." Now is the breeding season for the toads, and they can easily be found in abundance in almost every little pond or puddle of water. The tree toad that tells of coming rain all through the summer by his song is able to climb with the agility of the fly, having a foot of similar construction, and is also a most valuable insect destroyer.—[W. W. Meech, Vineland, N. J., April 9, 1889.

White Grub Injury to Strawberries.

* * * I will mail the white grubs with this. I do not know the scientific name of the insect—we only know them as the white grub. I would like to know if there is any better method of exterminating them than digging them up. My brother pur-

poses using a solution of Paris green and dipping the roots into it when we next set our strawberrry plants. Would it injure the plants? Would it in any way affect the fruit next season? Can you suggest any other preparation which would be as effective in destroying the grubs, but not so dangerous to handle? We have several acres of strawberry plants under cultivation, and of some 20,000 plants set last May it is safe to say the grubs have destroyed 6,000 of them, which we have had to replace. As to the ground under cultivation, it is a mellow clay loam; has been in strawberry vines about seven years, plowed last autumn and rest last May. In the time mentioned the patch has been fertilized with about 125 cords of barn-yard manure, a little over 5 acres, 3 in vines, the rest in grass. Here I will say that in hauling manure in August I have noticed hundreds, perhaps thousands of young white grubs in it, which leads me to believe the beetle is more apt to lay her eggs in a manure heap than elsewhere. In working among our vines in June and July, I have frequently found the eggs of some insect which I suppose to be the May beetle; they are perhaps one-fourth the size of a small pea, perfectly round, break very easily, and contain a whitish fluid. I remember of finding thirteen in one place. * * * The grub seems to feed on the roots of the plant as long as there is life in it. I do not know whether they go from plant to plant under ground or come to the surface nights. I suppose the former, as I never see any at the surface during the day unless dug up. Nor do I know whether toads hunt them below the surface, though I frequently find toads buried in the ground around the plants. Yesterday I placed a full-grown grub about 3 inches from a toad's nose; when he (the toad) made a move the grub disappeared as quick as a flash of lightning. We have previous to this year cultivated only on the matted row system, and although the grubs destroyed many plants it was not so noticeable as now that we cultivate in hills only. Generally it is only young plants they destroy. After a plant has matured it is seldom they destroy it; although continually gnawing at the plant, it throws out roots faster than *one* grub can eat them. Generally there is but *one* grub under a plant, though not infrequently I find two and three; even four are sometimes found working at one plant. But this is the exception and not the rule, except with young ones, when I frequently find six or eight eight in one place.—[L. E. Fogg, South Thomaston, Me., August 9, 1886.

REPLY.—* * * The larvæ which you sent were undoubtedly "White Grubs" and probably the immature forms of the adult beetle which you also sent, and which is, as you suppose, the common May beetle (*Lachnosterna fusca*). I must ask you again whether you are very sure that these grubs are eating the roots of your strawberries. If this is so I fear that you can do no better than to dig them up by hand. Your brother's proposition as to the use of a Paris green solution is not a practical one and will be of no avail. The eggs which you describe are too large to be those of the May beetle and are probably those of snails or slugs, and it is probable that the grub in manure is a different thing. The adult beetles, as you are doubtless aware, are readily attracted to light, and during the season of their flight (May and June) the use of lanterns suspended over pans of water with a scum of kerosene on top will doubtless destroy many beetles which otherwise would lay eggs in the ground among your strawberries.—[August 18, 1886.]

C

Larva of Cicada septendecim.

* * * To-day I have the pleasure of mailing to you a tin canister containing a Cicada larva *in situ*, and hope it will reach you intact. I almost despaired of finding one *at home*, and my pleasure is great at having succeeded. I examined the lump of soil carefully after finding the larva within and there was positively no hole to be seen that led to the gallery in which the larva was found, which shows that it does not travel about in search of food. You will see that the gallery is very short and just large enough for the larva to turn about in. You will see a hole in the dirt at one end of the gallery, but that I accidentally exposed when scraping the lump smaller to make it lighter and less bulky to mail. I think the best way to get the

ball out of the canister will be to hook something under the string that is around it and gently draw it out. * * * I am sorry that Professor Riley is not in Washington. However, you may be able to keep the piece of soil intact until he comes back. I scarcely expect you will be able to keep the larva alive, but that will not matter so much. One fact is ascertained, that the larva does not require roots to feed upon, neither does it travel about in search of food. I suppose it makes its way slowly and laboriously through the soil, and finds sufficient food in the fresh soil that it slowly brings itself in contact with. One strange thing is that it does not seem to make any difference how dry the soil is.—[J. G. Barlow, Cadet, Mo., August 20, 1886.

SECOND LETTER.—My civilized or tamed Cicada larva is still alive and growing, though I have had him in a small jar between three and four months, with nothing for him to subsist on except what he finds in fine, rather damp soil. What rather surprises me is that I always find him on the top of the soil, notwithstanding I *cover* him with fresh fine earth at intervals, in the hope that he will remain below the surface and act in a more *natural* manner. Though I have buried him in the new soil frequently, I always, next time I visit him, find him *pawing* around on the top.—[J. G. Barlow, Cadet, Mo., October 14, 1886.

REPLY.—* * * I am interested in the account of your tame Cicada larva. Does it not strike you that it comes to the surface on account of a lack of food?—[October 18, 1886.]

Some Additions to Packard's Forest-tree Insects.

I have been comparing my note-book with Packard's Bulletin No. 7, and have noticed several omissions in the lists therein which may be of some interest.

HICKORY.—*Saperda lateralis:* A large number of specimens on a windfall, in copulation. Philadelphia, June, 1882.

ELM.—*Saperda candida:* One pair in copulation on young elm. Concord, June 7, 1883. *Anthaxia viridicornis:* Eating leaves of elm. June 16, 1885. Several specimens.

PINE.—*Neoclytus erythrocephalus:* Two specimens. June 24, 1885. *N. muricatulus:* Common on cord-wood and standing timber. June 24, 1885.

OAK.—*Agrilus bilineatus:* Over one hundred specimens taken on a white oak. June 15, 1885.

Buprestis ultramarina is taken on pitch-pine at Gloucester, N. J., from April 20 to May 5. The Philadelphia collectors always look for it between those dates.

Goes tigrinus is commonly taken on the oak in Philadelphia, and not on the hickory as stated by Dr. Fitch and quoted by Packard.

I do not find these occurrences noted in Harris or Packard and so take the liberty of communicating them.—[Adams Tolman, Concord, Mass., June 25, 1885.

A Phytoptus on Plum.

I send you some shoots from a plum tree with a fungoid growth in the shape of small pustules at the base of the small branches and under the buds, and standing very thick in rings around the branch. They can also be traced with the glass all along the main branch, protruding from cracks of the outer bark. The tree is healthy and every branch and twig is loaded with the fungus, as I suppose it to be. * * *—[A. J. Caywood, Marlborough, N. Y., January 28, 1888, to Professor Scribner, Department of Agriculture.

REPLY.—Mr. Scribner has referred to this Division your letter of the 28th ult., accompanied by specimens of what you take to be a fungoid growth on small shoots of plum. On breaking open the small pustules, as you have noticed, they are found to be full of small mites of the genus *Phytoptus*. The pustules are evidently nothing but the galls of the mites. I do not recognize the mite, and am not aware that any species having this exact habit has been described. A close study will be necessary

to ascertain the exact life-history of this species and the best time at which to fight it. You can doubtless rid your trees at this time of the year by severe pruning, but the probabilities are that in the spring there will occur a time when the mites wander from their old galls to the new growth in order to form new galls. If this time can be ascertained, which can be done only upon the spot, it will be comparatively easy to destroy these creatures by spraying the trees with a dilute kerosene emulsion. I trust that you will follow this matter up and not fail to let me know the results and to send me specimens from time to time. I have every reason to believe that the galls are the winter form produced by *Phytoptus pruni-crumeni*, which produces in spring the little purse-like galls on the leaf.—[February 1, 1888.]

SECOND LETTER.—You think the galls on the plum tree may be a winter form of growth; the trees were infested the same during the summer and the summer previous. I never could make myself believe that knots on plums and cherries were of fungoid origin, as I always supposed they were caused by insects, as knots in the forest and other vegetable life are recognized to be, but scientists say fungi, and of course I was compelled to say so too. I now send you another package containing the regular black knot and the galls sent you last week so inseparably connected with them that I think you will say they precede the black knot, and I am inclined to believe that they are the first appearance of the same. You will notice at the base of some short spurs the pustules show the black and pinhead like sections of the fully matured black knot, and by looking the specimens all over you will find a growing similarity from the smooth fresh gall to the matured gall sections of the hard black knot; and it would seem that the development of the younger galls was arrested by the close of the growing season. I shall not be surprised if the branches that are covered with these galls will another season be a perfect scab of the common plum knot.—[A. J. Caywood, Marlborough, N. Y., February 6, 1888.

SECOND REPLY.—Yours of the 6th inst. with additional specimens came duly to hand. The twigs are interesting and the abundance of the mite galls is surprising. Their occurrence with the black knot is probably a simple coincidence as there is no possibility that they can have any connection with the black-knot disease, which, as is well known, is caused by a fungus (*Plowrightia morbosa*). It is barely possible that the attacks of the mites by weakening the vitality of the twigs render them more liable to the attacks of the fungus; but beyond this no possible connection can be plausibly traced.—[February 8, 1888.]

A Lac Insect on the Creosote Bush.

* * * I also mail you a small package containing stems with exudations of the creosote bush (*Larrea mexicana*) of which Dr. Loew says, "the reddish-brown exudation on the branches will yield a red coloring matter showing all the reactions of cochineal. The alcoholic extract of the leaves on evaporation yields a greenish-brown residue of a specific and somewhat disagreeable odor, more strongly perceptible on boiling the extract with water. This residue is only to a small extent soluble in water, and the solution has an acid reaction. It yields a light yellow precipitate with acetate of lead. The part of the alcoholic extract that is insoluble in water is easily soluable in alkalies. It also dissolves in nitric acid at a moderate heat, whereby oxidation takes place. On addition of water, a yellow, brittle mass is precipitated."

The Mexicans use an effusion of the leaves for bathing in, in rheumatic affections, and as long as the disease is in its first stages, with remarkably good results.

But apart from its medicinal properties, I am led to believe that these exudations, if properly examined, would give a splendid bright red coloring matter and a very superior varnish resembling the celebrated Japan lacquer. Do not you think it worth while to have the necessary chemical analysis made? There are miles upon miles of the bush growing here and far down into Mexico, and I should think that a man could gather from 60 to 100 pounds of clear exudation matter in a working day of ten hours. My supposition as to the qualification of producing a superior varnish is

based upon the experiments (incomplete though they were) of a French chemist who passed here about a year ago and who died since in South America.—[John A. Spring, Tucson, Arizona, August 21, 1887.

REPLY.—The portion of your letter of August 21, referring to the exudation of the Creosote Bush (*Larrea mexicana*) has been referred to the Entomologist, who reports that the specimens were received in good condition and that they form welcome additions to the collections of the Entomological Division. Strange as it may seem, it has been abundantly proven that this exudation is that of an insect and not directly of the plant. The insect in question is the *Carteria larreæ* of Comstock, described in the Annual Report of this Department for 1881–'82, page 211. This insect belongs to the Bark-lice or Coccidæ, and to a peculiar group of these insects which secrete wax and lac in different forms. It is closely related to the insect which produces the stick lac of commerce and which is known as *Carteria lacca* Kerr. Another species has been described by Professor Comstock, which appears upon Mimosa, in Mexico. This he calls *Carteria mexicana*. You will find a good discussion of the characters of these insects in the Annual Report of this Department just mentioned, and of the insect theory as opposed to the plant theory, including also some remarks upon the chemical properties of lac in the American Naturalist, Vol. XIV, p. 782 (November, 1880). You will also find the chemical properties of the stick lac of commerce treated in most of the chemical dictionaries or encyclopædias.—[August 31, 1887.]

A Rhizococcus on Grass in Dakota.

Inclosed please find two spears of grass with some eggs of something that I wish you to determine for me if you can, as the grass is infested with it all over this country. If you don't experiment with such things please hand it to some one who does. If they do not hatch until spring, a warm place and a little sprinkling would bring them to life. If they are injurious to stock let me know, as there are lots of horses and cattle running out here.—[A. E. Hall, Buffalo Gap, Custer County, Dak., February, 1888.

REPLY.—Your letter of recent date inclosing spears of grass with eggs laid in white sacs has been received and referred to the Entomologist, who reports that the white waxy sac is excreted by a bark-louse which seems to be a new species of the genus Rhizococcus. Up to the time of depositing the eggs the wingless degraded females of this insect are naked, but as the time for oviposition approaches they begin to secrete this smooth white sac all over the surface of the body, and as the secretion becomes thick they begin depositing their eggs, moving forward in the sac thus formed and after death shriveling up and remaining in the anterior portion. It will probably not have the slightest deleterious effect upon the stock.—[February 18, 1888.]

Wash for Apple-tree Bark-lice and Borers.

I find the most effectual wash for bark-lice on apple and pear trees and borers in apple and peach trees to be the following recipe: 5 pounds of potash (Babbitts's the best) and 5 pounds of lard dissolved in 5 gallons of boiling water; 1 peck good stone lime slacked in 5 gallons boiling water, while hot mixed with potash and lard. The above mixture can be kept in an old tub or barrel for any length of time. To use add to each gallon 2 gallons of boiling water, and while hot apply to trunk and large limbs with an old broom. If this mixture is applied to trees while young and used year after year, the bark of the trees will be kept as smooth as glass and all bark-lice and borers destroyed.—[J. Luther Bowers, Herndon, Va., February 24, 1888.

Saw-fly on Polygonum dumetorum.

To-day I mail a box containing some larvæ that may interest you. This is the first colony I have seen of them. They were found on wild grape vine, also on another climber, *Polygonum dumetorum*, which I enclose, and have the peculiarity of curling

themselves into a compact ring, on the *under* sides of the leaves, when not feeding. When undisturbed they are covered with a pretty close coat of very white down; some, as you will see, are without the down. They look like bird-droppings. The locality is a very shady woody ravine where the sunshine can not penetrate. In the box there is a small larva, found on a plant not common, in the same place.—[J. G. Barlow, Cadet, Mo., September 10, 1888.

REPLY.—* * * The species is *Emphytus testaceus*, being nearly allied to the Strawberry Saw-fly. The climbing plant which you enclose is *Polygonum dumetorum*. —[September 14, 1888.]

Oscinis sp. on Chrysanthemum.

Some one sends me a specimen of *Chrysanthemum frutescens*, with an insect pest that seems new to me. * * * —[Thomas Meehan, Germantown, Philadelphia, Pa., January 12, 1887.

REPLY.— * * * The insect infesting Chrysanthemum is a Dipterous leaf-miner of the genus Oscinis and is probably an undescribed species. I have received the same thing within a few days from Mr. Charles Henderson. Certain of the flies had issued on the way, so that it is now too late to do much in the way of hand-picking, which is the only available remedy. When another brood appears the infested leaves should be picked off and burned. In this way the pest can be very readily held in check.—[January 14, 1887.]

Ants destroying young Maples in Nebraska.

There is a small black ant that is destroying all of the young rock or sugar maple trees which have been grown from seed planted this summer in the western part of Nebraska. The seeds were planted on new land, opened last spring. I will give you a description of how the ants attack the young trees and how the trees are affected. They attack the trees just above the ground. The trees look as if they were stung. The bark turns brown as if it was decaying. There is a ring formed around the tree about one-eighth inch wide, and the young tree dies when the ring is completed. * * —[B. F. Blythe, Diller, Jefferson County, Nebr., July 16, 1886.

REPLY—* * * We should like very much to receive specimens both of the ant and its work on the young sugar maples. The efficacy of any remedy which you may try depends altogether upon the trouble and expense to which you are willing to go. The best preventive will of course be a broad band of bright tin fastened securely around the base of the tree. Search should be made for the colonies, which you can destroy by the use of bisulphide of carbon, which is poured in small quantities into the nest. Naphthaline in the form of a crystalline powder stirred in and about the hills is very effective in breaking up colonies. When they have begun to attack a tree it is with extreme difficulty that they can be permanently driven off.

Pyrethrum dusted upon the tree and scattered about its base kills all the ants with which it comes in contact and affords a temporary relief, but its effects are not lasting. Coating with shellac and binding the trunk with a band of tar cannot be relied upon to keep them off permanently. A broad band of rabbit fur, tied around the trunk with the hair downwards, is effectual in preventing their ascent. A still more simple and almost as effective one is a barrier of chalk. This is applied by rubbing a lump of raw chalk over the bark around the tree to make a band about 8 inches wide, and completely encircling the trunk. In attempting to cross such a band the ants nearly always slip and fall to the earth. This device is not permanent, and requires frequent renewal on account of the effect of dews at night and of rains. Very often soft clay, Fuller's earth, or talc may be substituted for the chalk, but in all cases must be applied by rubbing on from a dry lump. Good results cannot be obtained by using any of these substances in powder, dried, or as a whitewash applied with a brush.—[July 22, 1886.]

GENERAL NOTES.

THE SPIDER-BITE QUESTION.

The following item appeared in the *Evening Star* (Washington) for March 12, 1889, and is a fair sample of the newspaper reports in reference to spider-bites which are so common:

BITTEN BY A BLACK SPIDER.

Mr. Tileston F. Chambers, son of Mr. D. A. Chambers, of this city, came home from Princeton with several fellow-students to spend the inauguration holidays. On Saturday, March 2, he was bitten twice on the arm by what the doctor said must have been a black spider, with the most alarming results. Blood-poisoning and jaundice followed, but by careful treatment he is now rapidly recovering. The physician said that another bite would undoubtedly have proved fatal.

Learning by correspondence from Mr. D. A. Chambers that the physician in charge was Dr. Z. T. Sowers, of Washington, a well-known and prominent practitioner, we called upon Dr. Sowers, who informed us that he knew little more than was given in the newspaper statement. He said that he had had several such cases in his practice and that he was accustomed to attribute these bites to black spiders, for the reason that he knew of no other insect found in such localities which could produce the effect. The room in which young Mr. Chambers was bitten was one which had long been disused, and he occupied it on the night of March 2, for the reason that the rest of the house was full of inauguration visitors. Thus there is nothing special connected with this instance.

Professor Riley is under the impression that certain of these cases result from the bite of the Blood-sucking Cone-nose (*Conorrhinus sanguisuga*), an insect which is occasionally found in houses, and which is able to inflict a very severe wound with its beak.

Evidence in regard to fatal bites is very weak, with the exception of the genus Latrodectus, and this genus is never found in outhouses or disused rooms. Dr. Elliott Coues calls our attention to the fact that if the Latrodectus stories are true we have a case in this creature of the most powerful poison known. With the most poisonous snakes an appreciable quantity of poison, say one or two drops, is injected into the wound, but with the Latrodectus an infinitely smaller quantity seems to produce as strong an effect.

In this connection we may quote an item which falls under our notice in the April number of *Psyche*, and for the reliability of which the *Scientific American* (November 17, 1888, vol. LIX, p. 310) is responsible:

SPIDER POISONS.

Professor Breeger has recently investigated the poisons of spiders. He found that the Russian varieties of spider, *Phalanchium* and *Trochosa* (tarantula), are non-poisonous, but that a third, *Caracurt*, or "black wolf," secretes a powerful poison, forming

25 per cent of its whole weight. This substance is a peculiar unstable alkaloid, destroyed at 60° C., or by alcohol. Introduced into the circulation of warm-blooded animals, one-thirtieth of a milligram per kilogram of the animal treated was sufficient to cause death. It exceeds in power all known vegetable principles and prussic acid, being comparable in toxicity with the poison of snakes.

The following two letters also bearing on the subject are appended, the first of which is from Mr. R. Allan Wight, of New Zealand:

What Dr. Wright told you about the Katipo is perfectly correct. I was then living close by and knew all the parties and all the circumstances, and my sons also remember it all. It was as clear a case of Katipo poisoning as possible, and the man said he saw the spider bite him and minutely described the spider, which description tallied exactly with its proper one. A case occurred at Whangarei a few weeks ago, where a man was bitten and suffered a good deal, and I have written to the medical man who attended him and will let you know the result. I am also going soon on another long tour in the north, where I shall be able to get many tales and reliable information from both natives and white men as to the Katipo, and will let you know when I come back. I drove over to a man who is said to have lost his arm "*through a Katipo,*" but I found that he does not know one when he sees it, did not see the bite inflicted, was in a place where the Katipo does not live, and when the arm was removed *the bone was diseased* ("honeycombed"). That is one of those tales people hear and which make it difficult to believe anything. I feel certain the Katipo is a very dangerously poisonous spider, but I never but once saw a case with my own eyes. It was many years ago and I was out with a war party of Maoris; one night we found ourselves in an unpleasant position as far as they were concerned. On our rear there were a number of nice hollow places to sleep in, but as these were *Maori ovens*, in which men had been cooked for a cannibal feast, the natives not only would not sleep in them but they would not let me; so we lay down on the bare shingle beach with no tent in a high wind, and before us at a short distance was an island that is (they say) inhabited by evil spirits; so with spirits both before and behind we lay awake talking in subdued whispers.

I had my head on a rush bush, but they would have me shift it on to a rock, because they said the Katipo lived in the rushes by the sea-side. I was anxious for them to sleep, knowing that to-morrow we would want all our strength, but it was no use, for by and by a man screamed out that the Katipo had bitten him, and in a moment lights were brought, and sure enough the Katipo was there within a foot of the wound under his mat. The arm swelled, but not so much as to give alarm. What alarmed me more were his weakness and languor and the lowness of his pulse and his heart action. The poison certainly was a powerful *narcotic*, if symptoms go for anything. I gave him all the brandy we had, and the natives pretty well burned his wound and rubbed and rubbed at him till they got him into a perspiration, but he did not properly recover for several days, and if one had only known it would have been a mercy to have let him die (which I believe he would); so I thought when I saw him gasping his life away with blood and froth flowing from his mouth. Ugh! That is one of the several scenes I do not care to think about. By the by, I could not get the specimen; the Maoris burned it, as they said the Katipo is an *evil spirit and if we did not burn it the man would die.* I never heard of any Katipo but one; I think Taylor is mistaken. I have many chiefs here, and I asked them only to-day, but no one ever heard of but one Katipo—the black spider with a vermilion spot on the abdomen. * * * .—[R. Allan Wight.

Immediately after reading Dr. Corson's interesting article on Spider Bites in the March number of INSECT LIFE I went into a partially darkened room and drew on my bare feet a pair of felt boots that had been unused for some time. Simultaneously I received a sharp puncture on my ankle.

Dr. Corson's case of the man who was bitten on the toe while putting on his stock-

ing was at once brought vividly to mind; and all the circumstances favored the idea that I had been bitten by a spider.

From the reported cases it seemed that a painful experience was before me, if nothing worse; but I could not help feeling a certain exultation because the elusive creature had at last bitten the wrong man, and would soon be brought to the bar of justice and his photograph placed in an entomological rogues' gallery.

I took off my boot and, holding it carefully, lighted a lamp; and with infinite pains, lest some guilty thing should escape, I soon succeeded in dislodging a fine wasp!

Actuated by a strong sense of duty, nine out of every ten men will go out of their way to kill a snake of whatever species. Probably as many believe that spiders are capable of inflicting poisonous bites. Wasps are as common as spiders at some seasons of the year about out-buildings. Lacking more positive evidence, it seems probable to me that the sting of a wasp and the imagination of the patient are sufficient to account for many so-called spider-bite cases.—[G. M. Dodge, Louisiana, Mo., April 20, 1889.

UROPODA AMERICANA ON EUPHORIA INDA.

Mr. J. V. Dansby, of Pensacola, Fla., sends us a specimen of *Euphoria inda*, unearthed in the working of a hot-bed. It was covered with small parasites which proved to be *Uropoda americana.* This mite commonly infests many beetles, but we believe has not previously been recorded as infesting this particular species.

EVAPORATED SULPHUR FOR RED SPIDER IN GREENHOUSES.

Some interesting experiments have been carried on at Amherst by S. T. Maynard, the horticulturist of the Massachusetts Agricultural Experiment Station, which indicate that evaporated sulphur is not only a good fungicide, but that it is an excellent remedy against *Tetranychus telarius*—the common Red Spider. The remedy consists in heating a kettle of sulphur for three or four hours twice or three times a week to nearly boiling point in the room with infested plants, care being taken not to heat it so that it will take fire, but evaporating enough to fill the room with visible vapor and to make the sulphur odor perceptible. So perfect a remedy is this claimed to be that infested plants exposed for a few hours in the room where sulphur is used are said to be completely freed.

DOUBLE FLOWERS CAUSED BY MITES.

A large number of experiments have been carried out at Innsbruck by Professor Peyritsch, tending to show that double flowers may be artificially produced by the agency of a mite (Phytoptus). It seems that the professor was examining a wild double flower of *Valeriana tripteris*, and discovered that it was infested with the mites in question. He transferred these mites to other plants, chiefly of the orders *Valerianaceæ* and *Cruciferæ*, and a few *Scrophularineæ*, *Commelynaceæ*, and even others, but the best results were obtained in the first named. Various kinds of doubling were produced, such as petalody of the stamens and pistil, prolification and duplication of the corolla, etc., as well as torsions and fasciations of the shoot. The leaves were also affected,

the margin showing teeth like those of a comb. By infecting the plant at different times either the leaves or the flowers may be influenced, and it appears that the parasite must attack the organ in its earliest stages. Professor Peyritsch thinks that there are certain mites which produce double flowers in certain plants, as the mites in which he was particularly interested were always most abundant in certain species and less so in others. The experiments are recorded in the *Transactions of the Imperial Academy of Vienna*, Vol. XCVII, I, p. 597.

"The plants of *Valerianaceæ* experimented upon include *Valeriana* (twelve sp.), *Valerianella* (three sp.), *Fedia*, *Centranthus* (three sp.), *Patrinea*. Abnormal leaves were induced in ten species of *Valeriana*, all of the *Valerianellas*, two of *Centranthus*, and in *Fedia*. Double flowers were produced in *Valeriana* in six cases, three times in *Centranthus*, and once each in *Fedia* and *Valerianella*. Among the Crucifers Professor Peyritsch worked on *Biscutella*, *Brassica nigra*, *Capsella bursa-pastoris*, *Cochlearia officinalis*, *Eruca*, *Lepidium*, *Malcolmia* (two sp.), and *Sisymbrium sophia*. Various were the results; in many of the cases (*Cochlearia*, *Eruca*, *Lepidium*, *Sisymbrium*, *Brassica*, *Capsella*) bracts were formed resembling the leaves, but of smaller size; proliferous flowers were formed in *Brassica* and *Biscutella*; petalody of stamens occurred in *Cochlearia* and *Eruca*. In *Linaria cymbalaria* peloriate flowers and other changes were found.

"Professor Peyritsch says that the results are effective or not according as the plant is a good host-plant for the mite—a good host-plant being quite crippled.

"Among the Valerians, those plants with their leaves were more easily affected than others with more substance.

"The *Phytoptus* infesting the buds of the Hazel, Corylus, and which causes malformations in it, was transferred to plants of *Brassica*, *Sisymbrium*, *Capsella*, and *Myagrum*. Bracts were, in consequence, developed in *Sisymbrium*, *Capsella*, and *Myagrum*, in which, as in most Crucifers, the bracts are generally wanting; and in the last-named double flowers.

"*Bellis perennis* gave the same results when infected by the mites from *Valeriana*, *Campanula*, or *Corylus*, viz, the production of very hairy leaves, but not toothed, the disc florets green, and the involucral bracts elongated.

"It was observed that after infection growth in length was slow, but lateral bud development was accelerated unless other abnormalities appeared."—[*Udo Dammer*, *Berlin.—Gardeners' Chronicle*, March 16, 1889, Vol. V, p. 333.

RHEUMATISM AND THE STINGS OF BEES.

"A very nice supply of bee literature is furnished from week to week in the *British Bee Journal*. Amongst other wonderful discoveries of the present day it appears to have been reserved for Dr. Tere to have

discovered a cure for rheumatism in the sting of a bee. Those who have hands which refuse to catch hold of a thing properly through that painful disease, listen. He says he has tried his remedy upon 173 patients and been uniformly successful. As we have no means of contradicting him, his word must be accepted till we can disprove it. Hear ye, therefore, the words of the learned doctor. Herr Tere says, to the above 173 patients he applied 39,000 stings. The number seems to us rather appalling, but the doctor endeavors to inspire courage by saying that after the first sting the pain is felt less and less, till at last it is gone. When the pain of the sting is gone the rheumatism departs with it. Though I have had no experience of rheumatism, and therefore no need of cure, I can vouch for the pain getting less and less, after each sting, in my own case. Before dismissing the subject we might say that we have frequently heard cottagers, who have had rheumatism, and been stung accidentally, say that as the pain of the sting subsided, so did the rheumatism follow suit."—[*W. Chitty.—Gardeners' Chronicle*, March 30, 1889, Vol. V, p. 404.

THE BLACKBIRD AND THE BOLL WORM.

We learn from the April number of the *American Garden* that Secretary Bonham, of Ohio, on learning, a few years ago, that the Blackbirds were destroying the green-corn ears, and that his neighbors were all shooting the birds, investigated the matter, and found that wherever the Blackbirds had been at the corn they had extracted a Boll Worm. He thereupon told his hired man that the neighbors could drive all the Blackbirds over into his corn-field if they wanted to! This is an interesting experience, but was the evidence sufficient, the observations detailed enough, or the possibilities of error sufficiently guarded against to make it thoroughly reliable?

SWARMS OF A GNAT IN IOWA.

We learn from the *Daily Gate City*, of Keokuk, Iowa, March 28, 1889, that immense swarms of the little gnat known as *Chironomus nigricans* appeared in that vicinity within the few days previous, coming from the Mississippi and forming in the air in immense clouds, covering everything with which they come in contact.

NEW REMEDY FOR STRIPED BUGS.

Vick's Magazine states that a little calomel mixed with flour or ashes sprinkled on cucumber or squash vines will keep them comparatively free from this insect.

THE EUROPEAN RIBBON-FOOTED CORN-FLY.

We notice in the *Rural New Yorker* of April 13, under the head of "A New Insect Pest," an account of the damage done Barley and Rye by *Chlorops tæniopus*—the common Ribbon-footed Corn-fly of Europe—

in Sweden. It seems that on the island of Gothland Barley to the value of nearly half a million dollars was destroyed by this larva, while the same insect destroyed fully a third of the Rye crop of the province of Upland. We call attention to this as an item of news, but there is no reason for calling this a *new* insect pest. It has been known in Europe for many years, and was treated at considerable length by John Curtis in his well-known work on "Farm Insects," published in Glasgow in 1860, and had for many years prior to that date damaged Rye, Barley, and Wheat in England and on the continent.

SPARROW DESTRUCTION IN AUSTRALIA.

"Miss Eleanor A. Ormerod, consulting entomologist to the Royal Agricultural Society of England, has forwarded a donation of £5 to be applied to the destruction of Sparrows in South Australia. A subcommittee of the Royal Agricultural Society of South Australia has undertaken to raise subscriptions in aid of this worthy object, and it is proposed to have monthly competitions in the production of Sparrows' heads and Sparrows' eggs. These competitions will take place after the next autumn show in Adelaide. At the autumn show there will be a grand prize competition, when prizes of £2, £1.10*s*., 10*s*., and 5*s*. will be offered for the largest numbers of Sparrows' heads, and the same value in prize-money will also be offered for the largest numbers of Sparrows' eggs. Additionally to this, every competitor who fails to secure a prize, and yet brings in 100 or more heads or eggs, will receive a bonus of 2*s*. 6*d*., and any one producing under 100 and not less than 50 heads or eggs will receive a bonus of 1*s*. These prizes and bonuses ought to encourage the boys to exert themselves.

"An American paper tells us that: 'There is a scarcity of our native song birds; the Sparrow drives them away and destroys their eggs and young. Dr. Merriam estimates that a pair of Sparrows in ten years will increase to 275,716,983,698. They migrate over the country in grain cars, in which they have been caged while stealing breakfast. They can be destroyed by throwing down a handful of wheat and shooting among them with fine shot. The owl and hawk are very helpful and should invariably be spared.'

"In Victoria the fruit-growers are becoming alarmed at the depredations of the Sparrows, which are exceedingly numerous. A bill was lately placed before the legislature there, to provide means for relieving cultivators from this pest, but, as in South Australia, it was opposed by those who were not subject to losses, who were too indolent to examine into the truth of the complaints made, or who were too selfish to interfere in a matter in which they were not directly and personally concerned. A few of the opponents were led away by statements that the Sparrow does little harm in its native home in England, but it is a fact that it does a great deal of damage, though it is there kept from increasing so rapidly as in Australia—first, by the colder weather,

which limits the breeding season to a month or two, whereas in Australia the season lasts very nearly all the year through; and secondly, in England there are many owls, hawks, and other enemies which prey upon the Sparrows, whilst in Australia these enemies are almost entirely absent. Perhaps, when it is too late, the opponents to the Sparrow bill will find that their pockets and personal comforts are very intimately affected by the presence of hordes of these little pests, which drive away all the insectivorous birds, but will not touch an insect (except from pugnaciousness), but which will eat all the seeds of all the plants that grow in the fields, spoil all the fruit that is produced in the orchards and vineyards, and even attack the vegetables and flowers in the gardens when there is nothing else to destroy."—*Garden and Field* [Adelaide, South Australia], January, 1889, vol. 14, p. 92.

HERMETIA MUCENS INFESTING BEE-HIVES.

In August, 1887, Dr. W. B. Rohmer, of Grand Bay, Mobile County, Ala., wrote us concerning an insect that had caused much trouble to bee-keepers in his vicinity, accompanying his communication with specimens of the imago and also of the eggs which he had observed the insect in the act of depositing. Noticing the insects alighting in the vicinity of his hives, his attention had been drawn to them, and he found that they introduced their ovipositors beneath the entrance blocks or in the cracks between the hives and the bottom boards and remained in this position several minutes, perfectly motionless, repeating the operation a number of times. Upon investigation a large number of eggs were always found deposited. When the hives were removed for the purpose of cleaning them, worms in all stages of growth were found upon the floors, especially in recently transferred hives, where there had been a large accumulation of *débris* incident to cleaning away and sealing comb to the frames. In this *débris* of wax and foreign material all sizes occurred, from the tiny worm just hatched to the large one snugly ensconced in its web. Where the hives were clean and there was nothing in the bottom for the worms to subsist upon, the newly-hatched larvæ made their way up unobserved to the combs at the bottom of the frames, eating and growing as they advanced. The perfect insects were also seen laying their eggs in the cracks in the sides of old hives where the boards were nailed together, and for the reason that they have so many points of introduction these hives are more infested.

The specimens sent proved to be a true Dipteron, *Hermetia mucens*, which belongs to the Stratiomyidæ. Nothing similar to these habits has ever been published, so far as we are aware. In fact most of the species of this family, except some which are aquatic in their early stages, live underground and their life history is not thoroughly understood. This, therefore, is a matter of not only considerable scientific interest, but also much economic importance from the stand-point of the bee-keeper. That the Hermetia occurred in such locations and laid the

eggs mentioned there can be no doubt; but that Dr. Kohmer has confused the larvæ of Galleria or some other Guest-moth with the larvæ of the fly seems probable.

THE CHINCH BUG THIS YEAR.

A report comes to us from Mr. J. W. Beach, of Batavia, Boone County, Ark., to the effect that a general alarm prevails in that section of the country for many miles around in regard to the Chinch Bug. They did a considerable amount of damage there last year, and those that wintered over have already destroyed many fields of grain this spring. The wooded country in places is reported full of them, so much so that the people are contemplating setting fire to their woodlands.

CODLING MOTH DESTRUCTION IN TASMANIA.

We have in past years referred to the energetic way in which the authorities in Tasmania were dealing with the Codling Moth problem, and as an evidence of their continued work we quote the following from the Hobart Town *Mercury* of recent date:

> The inspector submitted a list of persons who had failed to send in schedules, and a resolution was passed to issue summonses to all in default. It was also resolved that the inspector proceed against all persons neglecting to gather and destroy infected fruit and also for neglecting to bandage their trees.

GAS LIME FOR THE ONION MAGGOT.

A correspondent of the *Gardener's Chronicle*, as reported in the issue of April 6, 1889, states that having had his cauliflowers, onions, brocolis, savoys, and cabbages destroyed by wholesale, had his garden trenched in the autumn and winter and gave it a thorough dressing of gas lime and salt and continued to use a slight dressing every season afterwards. The crops are no longer molested either by the Onion Maggot or by the Wire-worms. He states that salt should be omitted from the dressing if the land be heavy.

PARIS GREEN FOR THE GARDEN WEB-WORM.

In our annual report for 1885 in treating of this insect we urged as the most satisfactory remedy the use of one of the arsenical mixtures, and are glad to learn that experiments made in 1888 by Professor Cassidy, of the Colorado State Experiment Station, proved very effective. Professor Cassidy states that he made his first application of Paris green June 1, using 1 pound of the poison to 100 gallons of water, which proved to be very effective and not dangerous to the plant. A second application was made June 20 and another July 3.

PHYLLOXERA IN ASIA MINOR.

We learn through the *Gardener's Chronicle* of April 6 that the last number of the *Kew Bull tin* states that the introduction of Phylloxera

into Asia Minor appears to have been the result of a deliberate importation of the vines from a country where the disease was known to exist.

BARK LICE ON THE COCOA-NUT.

At the meeting of the Royal Horticultural Society, March 26, Mr. McLachlan exhibited leaves of the Cocoa-nut Palm from Jamaica infested by *Fiorinia pellucida* Sign. and *Mytilaspis buxi* Sign. (*M. pandani* Comstock), the former being the more abundant. Mr. Morris stated that he had seen a plantation of 25,000 trees badly infested and that the first attack was noticed in 1881 after the cyclone of 1880, the planters attributing the unhealthy condition of the trees to breaking of the roots during the cyclone.

IMPORTANT PUBLICATIONS ON ECONOMIC ENTOMOLOGY.

Relazione intorno ai lavori della R. Stazione di Entomologia Agraria di Firenze, per gli anni 1883–'84–'85. Per Ad. Targioni Tozzetti. Annali di Agricoltura, 1888. Firenze, 1888.

Report of Observations of Injurious Insects and Common Farm Pests during the year 1888, with methods of prevention and remedy (12th Report), by Eleanor A. Ormerod. London, 1889.

Report of Entomologist and Botanist, James Fletcher. Reports of the Officers of Experimental Farms for 1888. Ottawa, 1889.

We have received during the last month three of the most important works upon economic entomology which have been published by foreign Governments during the year. Professor Targioni Tozzetti has brought out the second of his extensive reports on the experiments conducted at the laboratory of the station for agricultural entomology at Florence. The first of these reports was published in 1884. The present volume is a large octavo of over 500 pages, illustrated by about 70 text figures, and is devoted mainly to the consideration of the injurious insects of Italy. Some attention is also paid to fungi. The greatest space given to any one insect is devoted to the Grape-vine Phylloxera, although many species of all orders receive treatment.

Miss Ormerod's report for 1888 covers 130 pages and is written with her usual great care and attention to the practical side of her work. The report this year covers a large number of species, and the longest individual article is that upon the new Corn Moth (*Ephestia kuhniella*), concerning which we have published a letter from Miss Ormerod in No 10 of *Insect Life*. Attention is called to certain injuries by Anguillulidæ, and a well-executed full-page plate is given to an Eel-worm attacking oat plants. She publishes another instructive table giving prices of the sales of sound and warbled hides in connection with a supplementary article on the Warble-fly (*Hypoderma bovis*).

Mr. Fletcher's report as entomologist and botanist to the Dominion of Canada possesses more interest to the American reader through the identity of the insects treated with those occurring in the United States.

The principal insects treated are the Wheat Midge, the Army Worm, the Wheat Stem-maggot, the Bean Weevil, the Clover Cut-worm (*Mamestra trifolii*), and Cut-worms in general. We sympathize with Mr. Fletcher concerning the poor quality of paper and press-work used in the Dominion reports which we have seen, and assure him that we consider his reports worthy of much more attractive form.

THE PYRETHRUM INDUSTRY.

We learn from the *California Florist and Garden* for March, 1889, that during the year 1888 there were imported into the United States from Dalmatia and other places between 200 and 300 tons of dry Pyrethrum flowers, while California's product was 52 tons.

A NEW USE FOR THE FLUTED SCALE.

A writer in a recent number of the *Florida Dispatch* suggests that inasmuch as there is a probability of overdoing the orange business in Florida (as it is estimated that that State will in the next five years be able to supply a box of oranges for every man, woman, and child in the United States), a good way to limit the production would be to introduce the Fluted scale (*Icerya purchasi*) into Florida!

CODLING MOTH NOTES.

Mr. D. B. Wier, in the *Orchard and Farm* (California) for March, 1889, in a general article on "Orchard Work," in which he summarizes the remedies for the Codling Moth, suggests that every large orchard should have a store-house or packing-house or building that can be made moth-proof, into which all apples and pears should be taken as soon as gathered. Packages of these fruits should never be left outside of this building over night. He suggests simply the covering of all openings in the building with fine wire gauze and the use of as few windows as convenient. The moths issuing from the fruit will fly to the windows, where they may be destroyed every morning. This suggestion is a good one, as we have shown in our article on the Codling Moth in the Annual Report of this Department for 1887, pages 97 and 98, where we quote the experience of Mr. DeLong, of California, who killed upwards of 15,000 moths in this way.

Prof. E. A. Popenoe gives a detailed account of his experiments in spraying apple trees with arsenical combinations in the first annual report of the Kansas Experiment Station, a review of which is published in the *Industrialist* for April 20, 1889. His experiments seem to have been carefully carried on and comparisons made with unsprayed trees. His best results were obtained with a mixture of 1 ounce of Paris green to 20 gallons of water. By the use of this two-thirds of the crop was saved at the expense of damage amounting to 8½ per cent. of the foliage.

OBITUARY.

We have just learned, through Dr. Marx, of the sad death of Count Eugene Keyserling, which occurred at Reichenbach, Silesia, April 4. Count Keyserling's death is an irretrievable loss to the study of American Arachnology. For a number of years he had been engaged in studying the spiders of North America, and had published in the Ver. d. k-k. Zool. Bot. Ges. seven numbers of his "New Spiders from America." He had also published a monograph upon the Laterigrades of America and the Theridiidæ of America. In the last two monographs he used, in addition to his other material, Dr. Marx's extensive collection, and also in the two last numbers of his "New Spiders from America." He was also engaged upon a monograph of the Epeiridæ of North America, but some time before his death interrupted this work to finish the great monograph commenced by Koch on the "Spiders of Australia." At the present writing we are not informed as to whether this work is completed, but if not it seems to be followed by a fatality, for Koch lost his eyesight while engaged upon it. Count Keyserling was quite advanced in years.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

May 2, 1889.—Mr. Ashmead read a paper on some South American *Chalcididæ*. He exhibited a number of interesting genera not found in North America, and gave his reasons for changing the systematic position of several genera. He also showed a remarkable Encyrtid, with six-branched antennae, allied to Tetracnemus.

Mr. Howard read a paper on "The Authorship of the Family *Mymaridæ*." He showed that the authority should be "Haliday," as he used it with family rank in "Hym. Brit.," London, 1839.

Mr. Schwarz read a paper on "Economic Entomology in Southern Florida." He found most of the cultivated plants remarkably free from injurious insects, especially the semi-tropical ones. The Limes, however, have a serious enemy in *Artipus floridanus*, which is especially destructive to the buds on the young trees. Egg-plants and tomatoes were also badly infested, the latter by a West Indian Heteropteron (*Pthia picta*), not hitherto found in the United States.

Mr. Schwarz also spoke of the beetle (*Lasioderma serricorne*) in smoking tobacco. It is rarely found in tobacco manufactured in the North or in the very finely cut (so-called "Turkish") tobaccos. In tobacco badly infested the insect may be found in all stages at any season of the year.

WILLIAM H. FOX, M. D.,
Recording Secretary.

U. S. DEPARTMENT OF AGRICULTURE.

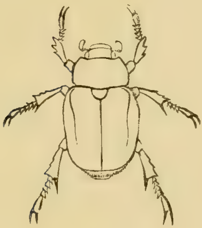
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. JUNE, 1889.

Vol. I. No. 12.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS.



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SPECIAL NOTES.

Australian Entomology.—We are pleased to notice that the *Garden and Field*, published monthly at Adelaide, is devoting more and more space to pure and applied science. Mr. J. G. O. Tupper is contributing a series of articles under the caption "Common Native Insects," and usually occupies all of the first page of this octavo journal. He gives popular descriptions of these insects, and names their habits.

The second page is usually occupied by Mr. Frazer S. Crawford, under the department heading "Notes on Garden Pests, etc., during the Month," and the third page is devoted to the reports of the meetings of the microscopical section of the Royal Society of South Australia.

In the April number Mr. Crawford occupies considerable space in a consideration of the statement by Mr. Skuse to the effect that the Lestophonus on Icerya and Monophlœbus is divisible into two species, and concerning which we have already published an article by Dr. Williston in No. 11 of INSECT LIFE. It seems that Mr. Skuse is now engaged upon a monograph of the Australian Diptera.

Mr. Crawford also devotes some space to a consideration of the Oyster-shell Bark-louse of the Apple (*Mytilaspis pomorum*), which it seems is abundant in certain sections of Australia. He also attacks our remark in No. 7 of INSECT LIFE (page 230) in which we expressed ourselves as being a little incredulous concerning his statement that infested leaves fall from the effects of an application of the resin-soap solution, while healthy leaves are not affected. Our incredulity was based upon our own experience, which is to the effect that healthy leaves are quite as badly damaged by most insecticides as leaves infested with scales.

The proposed Entomologists' Union.—As we have previously stated, the replies to our request for expressions of opinion in regard to the proposed general organization of economic entomologists have not been numerous up to date, but those which we have received have expressed so much enthusiasm in the plan that it begins to look like a matter of ultimate accomplishment. Mr. James Fletcher, Dominion Entomologist and president of the Entomological Club of the American Association

for the Advancement of Science, is in favor of issuing a call and organizing at the forthcoming meeting of the American Association which will be held in Toronto in August. It seems to us, that it will be an excellent idea to discuss the question thoroughly in all its bearings at this meeting, and, if possible, to permanently organize.

The Cave Fauna of North America.—Entomologists will be greatly interested in Dr. Packard's extensive memoir just published entitled "Cave Fauna of North America, with remarks on the anatomy of the brain and origin of the blind species," inasmuch as a large proportion of the animals treated are insects, arachnids, and myriapods. It is an octavo paper published by the National Academy of Sciences and has 156 pages with 27 plates and 21 text figures, together with a map of Mammoth Cave. We commend a perusal of this paper to the eminent astronomer who suggested that American cave insects should be much larger than those of Europe because our caves were the biggest in the world!

The Beetle which lived in an Insecticide.—Mr. Webster informs us by letter that the hellebore in which two adults of *Tenebrioides mauritanica* were found to have tunneled for a long time, as recorded upon page 314 of the April number of INSECT LIFE, has recently been tried at Lafayette upon gooseberry bushes infested by the Imported Currant-worm, with the result that it was found to have retained sufficient strength to destroy the larvæ. This makes his former observation more satisfactory.

Bulletin on Root-knot Disease in Florida.—We are just putting through the press Bulletin No. 20 of this Division, which is entitled "The Root-knot Disease of the Peach, Orange, and other Plants in Florida, due to the Work of Anguillula," by Dr. J. C. Neal, the present entomologist of the Florida Agricultural Experiment Station. The publication of this bulletin has been somewhat delayed, as Dr. Neal's observations were mainly made during the early part of 1888, but his results have not been anticipated by other observers. The character and extent of the damage done by these "Eel worms" will surprise those who have not studied them in the South, and we expect that the practical results of Dr. Neal's short investigation will be great.

The wide-spread and abundant rains late in May of the present year seem to have accomplished the usual result of greatly lessening the numbers of Chinch Bugs in localities from which they were early reported.

NOTES ON SOME INJURIOUS AND BENEFICIAL INSECTS OF AUSTRALIA AND TASMANIA.

By F. M. Webster.

The following observations, made during a hurried visit to these islands, may not be entirely devoid of interest to American entomologists. The value of these random notes will, however, be of minor service only, to colonial entomologists, owing to the fact that in the majority of cases, I have not been able to secure the names of the species under consideration.

We arrived in Tasmania in season to witness the last of an invasion of the "Green Bug," *Diphucephala splendens*, one of the *Scarabæidæ*, of a brilliant blue color and about the size of our *Dichelonycha fuscula*. On the 29th of January we visited the garden of Mr. Bidencope, near Hobart, and found a great many of his plum and cherry trees had been entirely defoliated, and some of his apple trees had suffered nearly as severely by attacks of these beetles. Pear trees were only slightly injured, and the same was true of strawberry plants. Gooseberries and black currants were not touched. They are said to also attack grain. The beetles had first appeared about six weeks before, and at the time of my visit had nearly all disappeared, myriads of dead being found on the ground, and a few live individuals were still to be found on roses, of which they appeared to be especially fond. They are stated to occur about Hobart, regularly every four years, and are supposed to originate in the woods, on the Wattle. They occur in different localities during different years, as Mr. Keen, of Kingston, about ten miles south of Hobart, stated that next season would be their year to appear in his locality. The same gentleman stated that he had observed them periodically for the last twenty years, and had known them to be blown across the river Derwent, near Blackman's bay, in such swarms as to commit serious depredations. The same species is similarly destructive in the colony of Victoria, Australia. In method of attack, and, indeed, in the actions of the adult in general, they greatly resemble our "Rose Bug," *Macrodactylus subspinosus*, and there is reason to believe that they could be successfully fought with pyrethrum.

Another very injurious insect, and one that appears to be very numerous in Tasmania, is a species of Earwig (*Forficula* sp.) which eats into and destroys ripe fruits. It seems to me that these could be easily trapped, as I found them swarming in orchards and gardens, under boards and rubbish, and also on the bands on fruit trees used against the Codlin Moth which were literally alive with them.

The Codlin Moth appears to be doing serious injury in most of the Australian colonies. The band system, the only generally applied preventive, seems to result as unsatisfactorily as it has in America. Our Australian cousins appear to be well provided with laws, looking

toward the destruction of insect pests, and if they can devise more efficient means of fighting these insects, they will, in all probability, be in better shape to cope with the Codlin Moth and other like enemies of the products of their orchards and fields, than we are here in the United States. From what I saw in Tasmania, I am quite confident that there are at least two broods of the Codlin Moth in that colony.

The American Blight, as the *Schizoneura lanigera* is commonly termed throughout the colonies, seems to be much more troublesome than with us. Not only nursery stock, but also trees which have been transplanted and fruited for many years, are alike subject to attack. Not only are the roots attacked, as with us, but trunks and branches suffer also. The insect seems to have an especial liking for the scars on old trees that have been left by the pruning of large branches. Australian nurserymen claim that varieties of apples, worked on stocks of the Northern Spy and Majentin varieties, will be proof against this blight if the grafting is done nine inches to a foot above ground. The pest is devoured in immense numbers by an exceedingly valuable little yellow and black Coccinellid,* great numbers of which were sent home by Mr. Koebele, my own share in the matter being to reach the locality where they were the most numerous, after they had disappeared. However, I found the same Coccinellid in Tasmania, where it was engaged in devouring the Aphids infesting the heads of carrots, which were being grown for the purpose of producing seed. Another smaller but similarly colored species of Coccinellid, but with two transverse zigzag black bands across its yellow elytra, the anterior one being sometimes continuous, but usually interrupted, was also observed likewise engaged. This Aphid, which was exceedingly abundant in the garden of Mr. Keen, of Kingston, near Hobart, did not appear to affect any other portion of the carrot, except the seed heads, and these were literally alive with them. It is a species of *Rhopalosiphum*.

The only other Aphid observed in conspicuous numbers was *Aphis maidis*, which was swarming on the sorghum plants growing on the farm of the Agricultural College of South Australia. At the time of my visit, February 9, the winged adults and earlier stages were ensconced among the young folded leaves of the sorghum plants, precisely after the manner of our Corn Aphis with us, at a corresponding season. Professor Lourie, principal of the college, informed me that the insects were sometimes so abundant on the plant as to render it obnoxious to stock, thereby unfitting it for green fodder.

During my visit to the above institution, Professor Lourie also called my attention to one of his fields of grass land, the surface of which in many places was now as bare as the floor of his office so far as growing grass is concerned. The ground was thickly punctured with small, round holes, and on digging in the vicinity of these we found myriads of small vertical cells, several inches in depth. The major part of these cells were lined with a thin silky web, within each of which we

* *Leis conformis* Boisd.

found a slender caterpillar, of a whitish color, with brown head. Some of these larvæ were quite large, nearly an inch in length, others not nearly so large, but all Lepidopterous, and, judging from their general appearance, belonging to the *Pyralidæ*.* If Mr. Fraser S. Crawford would solve the problem of this insect, he would, I am sure, do his colony a great service, and if he will give us the results of his studies, he will furnish American entomologists some very interesting information.

Phytoptus pyri occurs generally throughout Australia, I believe, and I found it affecting the foliage of pears in the garden of Mr. Bidencope, of Hobart, Tasmania.

The Grape Phylloxera occurs at present, I believe, in the colonies of Victoria and New South Wales, and it looks as though, without a combined effort on the part of all of the colonies, the pest would soon get a firm foothold and cause serious trouble in the future.

What is known as the Bryobia Mite (*B. speciosa*) is quite injurious to stone-fruit trees, and also to the apple tree. I saw it working on some of the trees at the experiment farm at Dorkia, Victoria, and understand that it is very injurious elsewhere. Professor J. L. Thompson, of the Agricultural College of Victoria, is of the opinion that the mite originates on the Almond, and spreads from there to other fruit trees. They do not appear to injure the foliage, but cluster in great numbers on the young shoots, especially at the forks. Mr. Crawford also says that "they give a pinkish-gray color to the twigs, caused by the mixture of the white of the moulten skins, the red eggs, the pink of the young, and dirty green of the mature mites, all huddled together."

While examining wheat straws, in a field of grain near Hobart, Tasmania, I found an adult fly, a *Chlorops*, which was within the stem. In another straw, in the same field, I found a larva which resembled that of an *Isosoma*, but in attempting to secure it the wind blew it away, and I failed to recover it. It might, however, have belonged to the species of Diptera just mentioned. With this exception I failed to find any wheat-destroying insects, and I know nothing as to what extent the one observed might be termed destructive.

The Eucalyptus Scale, *Eriococcus eucalypti* Cr., occurs in great abundance about Hobart, Tasmania, as well as in Australia. In the vicinity of Hobart, the scale is destroyed by certain Lepidopterous larvæ which live and move about within a web-like sac covered with excrementitious matter. When these larvæ were abundant there were few Eriococcus. These carnivorous larvæ may belong to one of the two species mentioned in No. 10, Vol. I, of INSECT LIFE. If so, the breedings of the adult will show it.† Almost an equally industrious enemy of the Eriococcus, and very frequently associated with the preceding, was a large black *Scymnus*,‡ which appeared to be in the midst of

* This insect is a Crambid which can not be determined from the material brought to Washington.

† This insect is evidently a *Dakruma*.

‡ *Scymnus restitutor* Sharp.

its breeding season. At the date of observation, January 28, these Scymni were nearly all pairing, and quite a large number of very young larvæ were afterwards observed in a box of twigs of Eucalyptus, infested by the scale, and which were collected at the time of observation.

So far as chronic depredators on farm crops are concerned, about the same state of affairs seems to exist in Australia as in the United States. White Grubs get in their work after the most approved American plan. A species of Migratory Locust originates in the interior and overruns considerable areas of farming country. A species of Caterpillar, with habits strangely like those of our Army Worm, marches through fields of grain, leaving destruction in its wake. I was informed that this pest was more liable to occur immediately following a wet winter, late sown oats being especially subject to attack. The Grain Moth, *Gelechia cerealella*, and the Rice Weevil, *Calandra oryzæ*, cause serious damage to stored grain.

Early in February it was stated that in the vicinity of Caisus, Queensland, "millions of caterpillars were clearing all vegetation before them."

TWO NEW SPECIES OF SCYMNUS.

By Dr. DAVID SHARP, *Wilmington, England.*

[NOTE.—The Australian and New Zealand Coccinellids which were imported by Mr. Koebele to California in the hope that they will become acclimatized and feed upon the Fluted Scale were sent to Dr. Sharp for determination. As he finds among them an interesting new species, and as this is perhaps the most prominent of the species brought over, he has sent us a detailed description, which we publish below, together with one of a closely allied species which he had formerly received from New Zealand.—EDS.]

Scymnus restitutor n. sp.

Major, ovalis, niger, cinereo-pubescens, prothoracis margine anteriore utrinque antennis que pallide testaceis, illis apicem versus fuscescentibus subtus abdomine pectoreque sordide testaceis. Long. $4\frac{1}{2}^{mm}$.

The upper surface is closely and rather finely punctured, the pubescence suberect, a little curled; the thorax is rather narrow, so that the outline is discontinuous to a greater degree than is usual in the genus. The under surface is of a sordid yellow or pale red color, more or less infuscate at the sides and in front; the tarsi are fuscous red, and the claws are all simple, neither toothed nor lobed. The prosternal lines are rather long, and not at all curved in front; moderately distant at the front margin they continue in slightly divergent directions to the hind margin. The epipleuræ are unusually broad. Claws of the hind feet simple, those of the middle and front feet feebly lobed at the base.

Found in Australia.

This species does not resemble any other Scymnus known to me at all closely, except an undescribed species from New Zealand, which, owing to this circumstance, it may be well to characterize.

Scymnus circularis n. sp.

Rotundatus, convexus, nigerrimus, pube longiore pallide-grisescente irregulariter vetilus, fortiter punctatus ; abdomine rufescente, antennis tarsisque flavis, ad apices fuscis. Long., 3mm.

Thorax sparingly punctured, with a very small flavescent mark on the anterior margin on each side. Elytra rather coarsely and not closely punctured, bearing a fine, rather long, almost white pubescence; this pubescence is not depressed, and the individual hairs do not take a straight or parallel direction. Prosternal lines subparallel, slightly curvate at the anterior margin, and slightly sinuate behind. Metasternum sparingly and rather coarsely punctate ; hind coxæ very widely separated. Front and middle claw with a long appendage extending the greater part of the length of the claw, and with free sharp extremity, so that the claw appears bidentate ; claw of hind foot with shorter lobe.

This species has been found by Mr. Richard Helms, in 1884, at Picton, South Island, New Zealand. A species smaller in size, but very similar in color and outline, has been found by Captain Broun on *Fagus cunninghami* in the North Island.

S. circularis is smaller and of much more circular form than *S. restitutor*, and differs in the structure of the claws and other important particulars.

A CASE OF LACHNOSTERNA DAMAGE.

In the August number of INSECT LIFE, pp. 58 and 59, we noted the defoliation of young plum and cherry trees in an orchard belonging to Mr. J. Luther Bowers, of Herndon, Va., occasioned by the attacks of the Twelve-spotted Diabrotica. This very unusual habit of the Diabrotica was accounted for in the article referred to by the fact that the trees had been planted on land that had been in melons the previous year, and we then felt little hesitancy in predicting that this beetle had not formed a new food habit and would not again be thus troublesome. We instructed Mr. Bowers to be on the lookout for it this spring, however, and on May 9 we received a telegram from him which read, "The bugs are destroying everything." This, while somewhat indefinite, from the previous experience with the Diabrotica, led to the inference that this beetle had re-appeared in force.

We immediately sent one of our assistants, Mr. C. L. Marlatt, to Herndon with spraying appliances, to learn the exact nature of the present outbreak, and to use such measures as would be advisable to prevent further injury. The following facts are gathered from his report:

Examination of the orchard, on the afternoon of May 9, showed that for the Plums and Cherries the amount of injury had not been overstated by Mr. Bowers. Certain varieties of the trees mentioned were entirely defoliated and nearly all were more or less injured, the outer half of the branches having been especially attacked. At this time, 6.30 P. M., the trees were comparatively free of insects; a single specimen of

the Diabrotica, and one of the well-known Apple pest, the Imbricated Snout-beetle (*Epicærus imbricatus*) were found. A number of specimens of a plant-feeding bug (*Euthoctha galeator*) were observed piercing and sucking the juice of the tender terminal growth of the plum trees, causing the attacked portion to wither or "blight." This bug was supposed by Mr. Bowers to have caused the defoliation of his trees, and while this of course could not be the case, the very injurious habit of this insect, as noted, is worthy of record here. The ground beneath the injured tree was seen to be covered with dark-colored excrements of some large beetle, probably of the May Beetle (*Lachnosterna* sp.); and an examination of the soil about the trees showed numbers of these beetles concealed near the surface. The orchard was again visited after dusk, between 8.30 and 10, and these beetles were then found feeding on the trees in great numbers, thus removing any doubt as to the authors of the injury. As many as seventy-five were taken from a single small-sized tree, and on others already defoliated beetles were found clustered about the twigs gnawing at the petioles and bark. The common May Beetle, *L.* (*fusca*) *arcuata* Smith, was found to largely predominate; other species of Lachnosterna were associated with this common form, but in much fewer numbers. The determination by Mr. E. A. Schwarz of a considerable quantity of beetles collected as they occurred on the trees, here given, will indicate the comparative abundance of the different species.

Lachnosterna arcuata	161 ♂♂ 152 ♀♀	313
dubia	2 ♂♂	2
fraterna	5 ♂♂ 1 ♀	6
hirticula	12 ♂♂ 12 ♀♀	24
tristis	6 ♂♂ 9 ♀♀	15

Mr. Bowers states that the injury of the present year, while more severe, is not different from that of last year, and also that he then saw similar excrements about the defoliated trees. This would indicate that the May beetle may be charged with a considerable portion of the last year's injury; the attacks of the Diabrotica later in the season only aiding in the work of destruction, although Mr. Alwood's observations as reported in our previous article are not to be discredited.

The smooth-leaved sorts of Plums and Cherries were this year, as also last, especially attacked. The Apple and Pear trees, among which the others were planted, were, however, uninjured. The first mentioned trees in the following list were most severely attacked; those marked with a star were injured the previous season also. *Plums*—German Prune,* Shropshire Damson,* General Lee,* Green Gage, General Hand, White Egg, Wild Goose; *Cherries*—Gov. Wood,* Black Tartarian, Napoleon Bigarreau. The Hansel Raspberry was also attacked both years. The May Duke Cherry and Weaver Plum were untouched.

The Plums and Cherries, about six hundred and fifty trees, and the Hansel Raspberry were sprayed May 10 with London purple and water in the proportion of 6 ounces of the former to 50 gallons of the latter—a Nixon pump and nozzle being used for this purpose. Concerning this application, Mr. Bowers writes, under date of May 14, as follows:

The bugs were less Saturday night (May 11). Last night I found only from three to eight per tree; yesterday I found some dead under weeds and grass. I shall spray about Friday or Saturday. We have had very heavy rains, and I think the poison is all washed off.

It is impossible from the above to determine whether the decrease of the beetles is owing to the spraying or other cause, such as the rain. Later communications from Mr. Bowers show that on account of continual rains during May he did not spray again. The trees were not damaged further, and the beetles became rapidly less numerous, although dead ones were not found. It is probable that the poisoned beetles were able to conceal themselves before the poison took effect.

NOTES ON PRONUBA AND YUCCA POLLINATION.*

By C. V. Riley.

Partly because of more pressing duties, partly because of a desire to make some special experiments, but chiefly in the hope that (after the fruiting season of the dehiscent Yuccas was over, and Mr. Hulst had been able to make more careful observations) he would himself gracefully amend his opinions to accord with the facts, I have deferred answering till now the remarks by Mr. Hulst on pp. 236–238 of Vol. II, Ent. Amer. The matter is too important to drop, and I have too much regard for my critic personally, and hope for his future entomologically, not to do what little I can to check an unfortunate tendency to hasty work and conclusion, noticeable in this as in some other of his late writings.

Mr. Hulst "confesses the corn" in reference to my first complaint, and is inclined to blame the report for his misrepresentations—an inclination which would have more of my sympathy were he not editor of the paper.

It is, however, far more important, from the scientific side, that he confess to the justness of my second indictment, and it is to this end that I return to the subject.

* In explanation of the controversial nature of this communication, it becomes necessary to refer to a dispute on this subject between the Rev. G. D. Hulst and myself in the columns of Entomologica Americana during the summer of 1887. The communication is a reply to Mr. Hulst's last publication on the subject, and is presented *verbatim et literatim* as written on my way to Europe in August of that year, and as mailed to him from England. Mr. Hulst is editor of the aforesaid journal, and exercised his editorial prerogative in declining to publish the communication. I have, therefore, concluded to present the paper to the Society, since it discusses matters of considerable scientific interest.

Mr. Hulst adheres to his belief "that there must be very extensive fertilization of the dehiscent species of Yucca by the agencies of bees and other insects." He does not bring forth a single definite fact or observation of actual pollination to prove or sustain the belief, but rests it on the following grounds:

1st. That Meehan found that the mere application of pollen to the papillose apex of the stigma is sufficient for fertilization.

2d. That he (Hulst) has seen honey-bees within the open as well as the partly open flowers, as also other insects, Aphides and Coccinellidæ being particularly mentioned.

3d. That not one in ten of the capsules subsequently examined by him showed the larva.

4th. That he is informed that dehiscent species of Yucca do ripen seeds in Europe.

Such are the negative arguments upon which rests his belief in the face of all the *facts* I have put on record. Let us consider the former briefly in their order.

1st. My good friend Meehan has written much on the fertilization of Yucca—much, too, that has not shown the keenest penetration nor the strictest accuracy. But, in candidly admitting his errors when shown to be wrong (as he has done to the writer, and, I have reason to believe, to Mr. Hulst, who sought his support in the belief here combated), he has proved himself to be the true naturalist. I am familiar with his experiments, having witnessed the results, and can best express my own opinion by quoting from a letter from the late Dr. G. Englemann (written January 10, 1881), in which, among other things, he says:

> As to Meehan's operations, I have seen myself the fine, large, well-filled pods of *Yucca angustifolia* raised by him by his artificial method. He says he punches an anther into the stigmatic cavity. Whether he or anybody else could distinguish whether the pollen adheres only to the papillose (not stigmatose) apex or gets into the liquor that fills the cavity when the stigma is ready to conceive, is a question (or no question)!

Meehan's experiments were made on a species in which, as I have elsewhere shown, the stigma is shorter and the stigmatic liquor more abundant than in *Yucca filamentosa*, and it may be that for these or other reasons it is more easily pollinized by hand or by other means than by Pronuba. But I have followed up his experiments, and made many others during the past seven years, on *filamentosa* and *aloifolia*, with results that convince me that application of the pollen to the papillose apices only is not sufficient to insure fructification, at least in those species. My experiments have been made in the afternoon, evening, and morning, with flowers one day, two days, and three days after opening; with pollen from the same flower or from other flowers either on the same or other racemes, by touching the mere apices with anther or brush, and by forcing the pollen by either conveyance into the stigmatic tube. In these experiments, which have not yet been published, and which it is unnecessary to detail here, I have endeavored to guard

against all influences, such as the condition of the plant and the weather, which might affect or vitiate the results. These may be summed up thus:

(1) Dr. Englemann's limit of time during which fertilizations may take place must be extended so as to include the second evening, and even the second morning, after the opening of the flower.

(2) No seed has been produced by merely touching the apices of the stigma with the pollen, though partial fertilization may take place and cause the growth of the fruit for a varying period, generally only three or four days. When the pollen is thrust into the tube (the mode of conveyance making little difference) fertilization is much more certain, but even here is rarely sufficient to produce ripe seed, the upper part of the pod often filling well, but the basal part not filling, and at last withering, so that the fruit ultimately falls off before ripening.

The conclusion is inevitable that *angustifolia* is more susceptible to artificial pollination than the species which I experimented with, and that Pronuba far excels man in the perfection with which she performs the act. She has the power of fertilizing all the ovules, at which no one will wonder who has carefully watched her, because the act of pollination is normally repeated several times, first from one of the angles between the apices, then from another, and, as Prof. William Trelease has shown, the tongue is used, in addition to the tentacles, to push the pollen down to the bottom of the tube.

2d. I have made careful search the past summer, and have had my associates, Messrs. Howard, Pergande, and Lugger, assist in the search for honey-bees in or about the Yucca flowers in Washington. There were over two hundred stalks under observation, most of them of easy access, on the grounds of the Department of Agriculture. Neither of the three gentlemen mentioned detected any bees, but I succeeded on two occasions, and each time between 9 and 10 a. m., in finding a single bee flying about the flowers. In neither case did the bee make any attempt to enter, but in each it probed around the outer base of the flower in search for nectar, and soon left evidently without being able to get much. These facts I record not in any way to cast discredit on Mr. Hulst's statement, but rather to show how very different from his own has been my experience in this direction, both in St. Louis and Washington. Not that I place much faith in the constancy of bees, which are known to be somewhat fickle in their tastes according to season or colony, a fact that may account for the difference in our experience, as may also the presumption that *Apis mellifica* is more abundant in Brooklyn than in Washington, or, again, the known fact that *Yucca angustifolia* is less scant in nectar than its filamentose congener. Be that as it may, our *Apis* has plainly, so far as observed, been after nectar, and has shown no disposition whatever to go near the stigma, and this fact is, as I have learned, corroborated by Professors Cook and Beal, of the Michigan State Agricultural College, where, for the first time

this year, they have observed honey-bees about the Yucca flowers. It is further corroborated by experiment which I made this summer of confining bees to the flowers within a gauze inclosure.

As for pollination by other insects, *Chauliognathus pennsylvanicus*, which feeds on both pollen and the nectar, is the most common species found in the flowers, and by virtue of these habits and its peculiarly modified mouth-parts, is most to be suspected; yet I have carefully watched it for years, only to be convinced that it never either assists or competes with Pronuba in the act of pollination.

3d. This argument has already been disposed of in my previous communication (Vol II, p. 238, summary iv), and it is only necessary to add, that until Mr. Hulst is more exact, and will tell us what proportion of his pods containing no larvæ also showed no signs of oviposition (*i. e.*, how many were perfect without sign of puncture or constriction or irregularity about the middle), we shall not even know how many the little moth pollinized without getting a chance to perform the other (to her) important act.

4th. This is contrary to my own experience in Europe, and to all authoritative record familiar to me, and until Mr. Hulst gives us his authority and the evidence, it were sheer waste of time to further discuss the point.

I have thus disposed of all the valid arguments brought forward by Mr. Hulst to sustain his position on this matter. I may briefly notice, however, a little satire which he indulges in at my expense, and a quite irrelevant assertion which happens also to be incorrect.

As one deeply interested in apiculture and a practical bee-keeper twenty-seven years ago, it was perhaps unpardonable in me not to qualify the statement about bees not being attracted to white flowers. Both Müller, in his "Alpenblumen," and Lubbock, in "Ants, Bees, Wasps," etc., have shown that bees prefer blue and purple to white flowers, and this is what was meant on the face of my language, so to speak; but Mr. Hulst has naturally made the most of the *lapsus*, and scored a point where every other point is against him.

The assertion which I would call attention to, and which is entirely beside the question at issue, is that "we are indebted to Dr. Engelmann for the discovery of the fact that Pronuba is an agent in the fertilization of Yucca."

Whatever may have led Mr. Hulst to make this assertion, it is simply untrue, and the facts, which I may as well put on record here, are these: In June, 1872, Dr. Engelmann, who then knew full well that Yucca needed extraneous aid in fertilization, called my attention to this fact, and to the further fact that insects, especially white moths and soldier-beetles (*Chauliognathus*), were common in the flowers. He made no observation whatever upon insect pollination, but wished me to study the question. The discovery that Pronuba was the agent was my own, as were all the subsequent discoveries in reference to the in-

sect made that year; but they were always communicated to him, and often shared with and witnessed by him.

My first paper on the subject was read in August, 1872, before the A. A. A. S., at its Dubuque (Iowa) meeting, and presented to the Academy of Sciences of St. Louis at the meeting for September 2, 1872. Dr. Engelmann's "Notes on the genus Yucca" were presented to the same Academy September 16, 1872. Both papers are printed in Vol. III of the Transactions of the Academy, Dr. Engelmann's preceding, because leading up to mine. In his paper Dr. E. says: "The *suspected* insects were handed over to my friend Mr. C. V. Riley, who thereupon took up the zoological part of the investigation, the surprisingly interesting results of which are detailed by him in the succeeding paper" (Trans., etc., III, p. 19), and I distinctly express my indebtedness to him "for drawing my attention to the fact that the plants of this genus must rely on some insect or other for fertilization." It is quite probable that but for Dr. Engelmann's suggestion I should never have made the investigations, and he should share with me whatever honor attaches to the discovery. If this is what Mr. Hulst means, his language is unfortunate. Dr. Engelmann was, during my residence in St. Louis, at once my friend, companion, and master in natural-history matters, and I have too much reverence for his memory to allow to pass unchallenged what he himself would repudiate were he still among us. As soon as I had learned that Pronuba was the agent, he sent a brief announcement to the Bulletin of the Torrey Botanical Club (Vol. III, No. 7, July, 1872, p. 33), rather hastily referring to the insect as "a white moth of the genus Tortrix," and in a subsequent communication (*ibid.*, August, 1872, p. 37) he corrected the error and recorded some further facts in the life-history of the insect. In neither case was there any claim of individual discovery of the entomological facts, and these announcements must be read in the light of his subsequent more deliberate language, which I have quoted.

In conclusion, having already devoted more time to Mr. Hulst's opinions than they justify, let me add that another year's study of Yucca fertilization has not only served to confirm all that I have hitherto written, but still further to enhance the importance of Pronuba to the plant and the intelligent nature of her unique performances. Prof. William Trelease, who has made the only other careful observations on the subject which have come to my notice, has demonstrated (Bull. Torrey Bot. Club, Aug., 1886, pp. 135–141) that the stigmatic liquor is not nectariferous, but that the slight amount of nectar associated with the flowers is secreted in thin pockets formed by the partitions that separate the three cells of the pistil, and which open externally by a contracted pore from which the nectar is poured through a capillary tube (inclosed by the closely applied, but not outwardly united, lobes of the ovary) to the base of the pistil, so that nectar-feeding insects seek it not about the stigma, but at the base of the pistil or of the petals, whether within or

without. I have fully verified Trelease's statements by dissection and study of the insects seeking this scant nectar, and indorse his conclusion that while the observations serve to disprove any positive value of their nectar in the pollination of Yucca flowers, they add to the importance of Pronuba by showing that the acts of collecting the pollen and transferring it to the stigma are performed voluntarily and without food compensation as I was at first inclined to believe

I have lately had the pleasure of studying *Yucca whipplei* in California and the remarkable Tree-yucca (*Y. brevifolia*) in the Mojave desert. The former is pollinized by *Pronuba maculata* Riley, and the latter by a most remarkably modified and adapted species which I expect to describe as *Pronuba paradoxa.*

Thus everywhere in the United States where Yucca nominally fruits we find it associated with its Pronuba.

I await with interest and curiosity any new discoveries in this connection, but, so far as present knowledge justifies anticipation, I should expect, where neither Pronuba nor Pronuba-like insect exists, to find the plant modified to more readily permit self-fertilization sooner than to find *Apis mellifica* the pollinizing agent, the opinion of Mr. E. L. Layard, of New Caledonia (who first expressed it in 1880—*Nature*, Vol. XXII, p. 606), and of Mr. Hulst, to the contrary notwithstanding. [*Reprinted from Proceedings Entomological Society of Washington. Vol. I, No.* 3, *pp.* 150–154, *read June* 5, 1888.]

NOTES ON SOME SPECIES OF INSECTS WHICH AFFECT THE UPPER PORTION OF THE STEMS OF SOME GRASSES.

By F. M. Webster.

There are several species among our common grasses which are more or less subject to injury at or near the upper joint, whereby that portion of the culm above is so injured that it will suddenly wither, turn yellow, and die, leaving the portion below this upper joint green and vigorous. Of the grasses thus affected that have come under my own observation, those most commonly injured are Blue-grass (*Poa pratensis*), Timothy (*Phleum pratense*), Bottle Grass (*Setaria glauca*), and Panic Grass (*Panicum crus-galli*).

The extent to which Blue-grass is subject to this attack in the United States, east of the Mississippi and north of the Ohio Rivers, has attracted considerable attention, as it has also in Canada.

In his Third report as State Entomologist of New York, page 96, Professor Lintner calls attention to the fact that similar injury to this grass was observed long ago and recorded in the Quarterly Journal of Agriculture and Science, I, 1845, page 263. Professor Lintner in this notice

states that he had recently received specimens of injured grass from Emmett, Ohio, and also from Union Springs, N. Y., but was himself unable to determine the nature of the depredator. In one of the stems of grass sent from Union Springs he found some globular, transparent, rather large eggs, which had been placed under the sheath near the joint. These eggs hatched lepidopterous larvæ, which fed within sections of grass stems with which the professor supplied them, but did not reach maturity.

In his review of this notice, Prof. J. H. Comstock, in the *American Naturalist*, vol. 22, No. 255, page 260, stated that he had, thirteen years previous, published a notice on the subject, giving an account of the depredations of a species of Thrips, *Limothrips poaphagus* MS., the description of which he had never published.

Professor Comstock states (*loc. cit.*) that the young insect pierces the stem of the grass, just above the upper joint, causing it to shrink, and all parts above the injury to die. He also says that the insect obtains its growth under the sheath, at the point stated, after which it crawls forth, and can be swept from the grass in great numbers. He further states that it occurs first, each season, on the Blue-grass, which it injures the most severely, and later on Timothy and other grasses. He has not, however, been able to complete the life-history of this interesting insect.

In the Thirteenth Report of the State Entomologist of Illinois, Prof. S. A. Forbes, in a foot note on page 22, calls attention to this injury to the stems of Blue-grass and Timothy, stating that, judging from the appearance of a single pupa, found by him under the sheath outside the stem of Timothy, the injury to the grass was not due to *Meromyza americana*, but that the pupa found by him belonged to a species of Chlorops; but he was unable to say to what extent the species figured in the injury to the two grasses named.

In his report as Entomologist to the Department of Agriculture of Canada for 1885, p. 11, Mr. James Fletcher devotes considerable space to the discussion of similar injuries to both Blue-grass and Timothy, giving reports from a number of his correspondents showing that the damage there is quite a serious matter. The major portion of Mr. Fletcher's correspondents appeared to attribute the injury to the work of the Joint Worm, but a Mr. Brodie, of Toronto, had found the larvæ of a fly (*Chlorops*) doing much harm in several townships in the county of Ontario.

In his report as Entomologist of the Dominion Agricultural Experiment Farms for 1888 the same gentleman again refers to the subject, and reaches the following conclusion:

> Now, from the above observations and some others mentioned below, made by trained entomologists, it is perfectly certain that there are injuries to grasses by different insects, the effects of which are very similar in appearance, and all of which would be classed under the head of "*Silver-top*," but for each of which a different treatment might be necessary.

Professor Fletcher states that while the injury appears first on *Poa pratensis*, it is afterwards observed on Timothy, *Phleum pratense*, Conch Grass, *Triticum repens*, *T. caninum*, and *Poa serotina*.

In June, 1886, while at home from the South for a short time, and while examining a quantity of injured Blue-grass stems, I found two pupæ resembling, in a general way, that of *Meromyza americana*, but smaller, and agreeing reasonably well with the description given by Forbes of the specimen found by him in Timothy. Being obliged to leave home again in a few days, for an indefinite period, a quantity of injured stems from the immediate locality was forwarded to the Department, but no adults were reared from them.

From the appearance of injured stems of Blue-grass I am confident that there are at least two entirely different species engaged in this work, one of which is some species of Diptera, possibly identical with that found by Forbes, in Illinois, and also with the species observed in Canada; the other belonging to some species of insect which extracts the juices of the culm without destroying the tissue. Both of these insects, if there are not, indeed, a much larger number engaged in this work, without doubt occur in Indiana.

Early in August, 1884, in the vicinity of Oxford, Ind., I found many of the stems of Panic Grass, *Panicum crus-galli*, infested just above the upper joint with a larva, in some respects resembling that of *Meromyza americana*. From a quantity of affected stems I reared a considerable number of adult flies, which proved to belong to an undeterminable species of *Chlorops*. These larvæ are much larger than those found in Blue-grass in 1886, and are of distinct species without much doubt.

Near the same locality, and about the same time, I found the Bottle Grass, *Setaria glauca*, affected in much the same manner, and rather expected to find the *Chlorops* larvæ doing the injury; but an examination revealed the fact that these larvæ were Coleopterous, and they were afterwards determined by Professor Riley as those of *Centrinus picumnus* Hbst., a small snout beetle, of the family Curculionidæ, and not uncommon in Illinois and Indiana.

Another larva, differing from either of the preceding, was observed burrowing in the terminal internode of a species of grass belonging to the genus Muhlenbergia, possibly *M. mexicana* Trin. This last larva was lost in the mails, and I have not since observed them affecting this grass. I have not yet been able to rear from or even observe any insect burrowing in the stems of Timothy; but there is scarcely a year that some of the heads do not turn white, in June, from some injury near the upper joint.

EXTRACTS FROM CORRESPONDENCE.

The Mole Cricket as a Harbinger of Spring.

I send you herewith an insect locally known as the "Mole-bug," from the fact that it burrows a track or "run" just under the surface of the ground, very much as the mole does, and you will see, if the specimen reaches you in good condition, that its forefeet are very much like those of the mole. You may be familiar with the habits of this insect, and then you may not. The object I have in sending you this specimen is because of this very interesting fact, that the first appearance of the "Mole-bug" in the spring of the year is a sure indication that winter is over—that spring has come—that there will be no more cold weather. The "Mole-bug" announces his appearance just a little before dusk of an evening by the peculiar grating nasal sound it makes, in an unbroken repetition of tay-tay-tay-tay, which can be heard for a considerable distance. He is very shy, and not easily approached without the risk of disturbing his evening song, and causing him to seek safety by making a hasty retreat into his run, which he has made under the ground, from just outside of which he has been sending forth his harsh music.

I have been noting the first appearance of these insects for several years, and an old gentleman of my acquaintance, who first called my attention to this little prophet, says he has noted its first appearance for a great many years, and our observations warrant the assertion that when the "Mole-bug" is heard winter is over and spring has most emphatically arrived. It usually makes its appearance between the 20th and 30th of March; but the first one I heard this season was on the 17th of March, earlier than usual. I do not know that this information will be of any use to you, but then it is like taking a bread pill—if it does not do any good it will not do any harm. Farm work is progressing very rapidly in this section; the rain-fall during this month has been below the average, and no thunder or wind storms up to this date, which is something very unusual.—[B. T. Webster, Louisville, Miss., March 29, 1889, to Prof. R. B. Fulton, of the University of Mississippi.

First injurious Appearance of the Army Worm in Florida.

I fully believe that I have the true Army Worm of the North (*Leucania unipuncta*) on my place. They were first noticed about ten days since in a field of very rank Oats, which were shooting to head and about waist high. The worms exist in immense numbers. They have eaten the Oats to the bare stems and are spreading over the farm, destroying as they go. Ditches do not stop them, and I am now burning straw around the field during the middle of the day, at which time they are in motion. If you desire it I will forward specimens. They may prove to be the *Laphygma frugiperda*, but I believe them to be *Leucania unipuncta*. I have not heard of them anywhere else in the country, and have never known them to appear sooner than July or August until now.—[J. V. Dansby, Pensacola, Fla., March 1, 1887.

Reply.— * * * The appearance of either the true Army Worm (*Leucania unipuncta*), or of the Grass Worm (*Laphygma frugiperda*), at this season of the year in such enormous numbers as you describe is a matter of great interest. You are doubtless right in supposing that it is the first named of these two insects. We have already recorded the occurrence of the true Army Worm in Florida during late winter and early spring, but have never known of its occurrence in such injurious numbers. * * * We should be very glad to receive a large number of specimens from you. These should be inclosed in several small boxes together with a supply of grass or other food, and sent by mail. We hope that you will give us every detail of this invasion.—[March 5, 1887.]

SECOND LETTER.—Yours of the 5th instant received to-day. I now forward by mail four boxes of specimens: No. 1, gathered from Texas Blue-grass; No. 2, from Radish; No. 3, from green Peas; No. 4, from Oats. I have placed their respective foods in the boxes with each. * * *—[J. V. Dansby, Pensacola, Fla., March 9, 1887.

SECOND REPLY.—Yours of the 9th instant, with four boxes of Army Worms, came duly to hand. They are the genuine Army Worm (*Leucania unipuncta*), and therefore you were right in your surmise. This is, as stated before, an interesting fact, as the insect has never been recorded as occurring in injurious numbers so far south as Pensacola. The probabilities are that as soon as this brood of worms disappears you will not be troubled with it again for some years to come. This same insect occurred in great numbers at Huntsville, Ala., in the spring of 1882, but in this southern location its natural enemies were so abundant that the large brood was almost entirely killed off, and has not been destructive in that locality since. You will probably have a similar experience at Pensacola.—[March 14, 1887.]

THIRD LETTER.— * * * In your communications you expressed a wish that I would give the details of this worm invasion in this section. They were first observed in a field of Oats on the 21st of February, though doubtlessly they were there some time before. Adjoining the Oats is an orchard which was in grass the past season. Last summer and fall were remarkably dry. For two weeks before the worms were noticed the weather was warm and foggy, with very little sunshine. The worms first appeared on the side next the orchard. The Oats were about 2 feet high, very luxuriant and growing rapidly. The worms seemed to go under the thick leaves of the bunches of Oats at night, fed most freely from early morning until noon and from that time until late in the afternoon they were in motion, crawling in every direction seeking new pastures. By the 15th of March, which was about twenty-five days after first being observed, the most of them had gone into the pupa state. Their favorite place for transformation seemed to be just barely below the surface of the ground, around the Oat stubbles, where they can now be found in large numbers.

On the evening of the 28th of February a heavy rain fell, followed by a norther, and on the morning of the 29th it was quite cool, with considerable frost, to which the worms appeared to be perfectly indifferent. A heavy rain also fell on March 8 without any effect. Besides the Oats, the worms manifested a liking for Wheat, Blue-grass, Corn, green Peas, Cabbages, and Radishes; also did some damage to Tomatoes and Egg-plants. They seemed to be indifferent as to Lettuce, Onions, Strawberries, Dewberries, Melons, and Cucumbers, neither did they feed on Butler Weed (*Gnaphalium purpureum*) or Mexican Clover (*Richardsonia scabra*), to which they had abundant access. In conclusion, I will state that my Oats are entirely destroyed, and that I saved my other crops by the free use of London purple. Although not a great many were killed by the poison, yet they would refuse to feed upon any plant to which it was applied. I am of the opinion that had I used it freely upon my Oats at the beginning they could have been saved from destruction. I have heard of no worms anywhere in the country except on my place. * * *—[J. V. Dansby, "New Farm," near Pensacola, Fla., March 18, 1887.

The Camellia Scale.

Can you suggest any remedy for this insect on my Camellias? The trees are about 12 feet high and all the leaves on the under side are covered with the insect; some look as if there were cotton growing on the leaves. It appeared here about five or six years ago. I have washed every leaf with whale-oil soap at one time, at another with resin soap, and at another with castor-oil, none of which has done any good. About the middle of March, when the trees make new leaves, all the old ones fall; the insect then appears about May or June on the new leaves. I send some of the leaves by this mail.—[Robert Halliday, Liberty Road, Baltimore, Md., January 14, 1887.

REPLY.—* * * The insect on your Camellias is the Camellia Scale (*Fiorinia camelliæ* Comst.). It has previously been observed only on the Camellias in the hot-houses of this Department, but has been so thoroughly treated that it is not common. You will find a good remedy in the application of a kerosene-soap emulsion, made according to the following formula:

Kerosene	2 gals.
Common soap or whale-oil soap	½ lb.
Water	1 gal.

Heat the solution of soap and add it boiling hot to the kerosene. Churn the mixture by means of a force pump and spray nozzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens on cooling and should adhere without oiliness to the surface of glass. Dilute one part of emulsion with nine parts of water. —[January 15, 1887.]

The Australian Lady-Bird.

In several of my previous letters to you I have expressed my belief that the red-and-black Lady-bug from Australia would prove more effectual as a destroyer of the Icerya than any of the other predaceous or parasitic insects recently introduced into this State from Australia, and I am now able to state definitely that such is the case. The Orange tree covered with a tent at Mr. Wolfskill's, in this city, where I colonized the first two or three consignments of these Lady-bugs, is now almost entirely free from living Iceryas, while on the adjoining trees many larvæ of this Lady-bug are now busily engaged in destroying these pests, and already the good work accomplished by them is apparent to the most casual observer. I have also colonized them in several localities in this part of the State, and in every instance the attempt has proved successful, the Lady-bugs apparently thriving quite as well here as they would in their native land.

From time to time I have carefully examined the Iceryas on the tree under the tent where I colonized all of the *Lestophonus iceryæ* received from Australia, but thus far have found no outward signs of parasites, although several of the Iceryas that I dissected contained larvæ of the Lestophonus. It is possible that in time this parasite may accomplish much good by destroying the Iceryas, but the work of the Lady-bug referred to above is so much more rapid and effectual that it seems only a waste of time to bother any longer with the slow-going Lestophonus. Certain it is that these two species could not live together in the same locality, since the Lady-bugs would devour all the Iceryas and the Lestophonus could not help itself. In comparing the work accomplished by the Lady-bugs with that of the Lestophonus, I am strongly tempted to uncover the tree inhabited by the Lestophonus and allow the Lady-bugs to accomplish the work that the slow-going Lestophonus should have done but has not. The latter may be an effectual destroyer of the Monophlœbus, but it is no match for the Icerya, and the latter would certainly have continued to thrive and spread devastation among our orange groves but for the timely arrival of the Lady-bugs, whose persistent, Yankee-like energy will soon result in sweeping this curse from our orange groves.—[D. W. Coquillett, Los Angeles, Cal., May 1, 1889.

It gives me the greatest pleasure to report that the colonization of the parasites upon my trees appears to have resulted remarkably well, so far. Large numbers have hatched on each of the three trees upon which we placed the boxes, and, better still, Mr. Scott Chapman and myself found three larvæ upon an adjoining tree, showing conclusively that the Lady-birds were already distributing their eggs through the orchard.—[J. R. Dobbins, San Gabriel, Cal., April 27, 1889, to D. W. Coquillett.

Valgus canaliculatus a Quince Enemy.

I have been watching for several years to see the enemy of the Quince that eats out the fruit buds when they are quite small. I send you a small beetle which I have

just caught in the act. You can no doubt give its name and life history. If new to you it will be of interest, and if not it may be a new discovery that it eats out the fruit buds of the quince. I should have been glad to have included it in the list of insect enemies when writing my book, but could not be certain what it was that did the mischief. Perhaps you may have it figured already, if not it might be well to preserve it for such use. Inclosed is a sample of the bud as eaten out.—[W. W. Meech, Vineland, N. J., May 1, 1889.

REPLY.—Your letter of May 1 and the beetle eating quince buds have been received. The new enemy is a Scarabæid beetle known as *Valgus canaliculatus*. It is a comparatively common species, but I believe has not before been recorded as having this habit. The larva of Valgus lives in decaying wood.—[May 13, 1889.]

Application to prevent Icerya from ascending Trees.

* * * I have recently been experimenting with various viscid substances to be placed around the trunks of trees to prevent the Iceryas from ascending them, and find that the following gives very good satisfaction: Resin, 4 ounces; beeswax, 1 ounce; cotton-seed oil, 5 fluid ounces. The resin and beeswax are first melted over the fire, the cotton-seed oil then added and the whole thoroughly stirred; when cold it is ready for use. When spread on the trunk of a tree this remains moist for over a week, but a better plan would be to apply it to the outside of a bandage of some sort previously placed around the trunk of the tree to prevent injury to the bark. This will make the process of washing the infested tree with pure cold water thrown upon it with considerable force still more effective by preventing the Iceryas that have been washed off from again ascending into the top of the tree.—[D. W. Coquillett, Los Angeles, Cal., April 1, 1889.

Lasioderma serricorne injuring Cigarettes.

I send you by mail to-day a few larvæ and beetles. With the limited literature at my command I have identified the insects as *Byturus unicolor*. Am I right? They are doing much damage to dry leaf tobacco and cigarettes. While in the egg or young larva state the tobacco is made into cigarettes. When the larva matures, it eats out through the paper, thus destroying the draught of the cigarette. They also cut through the paper package. Can you direct me to the literature on this insect, and has it ever come under the notice of the Department as injurious to tobacco or cigarettes? I have a quantity of tobacco infested on hand and am going to study the life-history and also experiment as to remedies, if none are yet known. Do you know of any remedies, or could you suggest any line of experiments? Would it be effectual and safe to use bisulphide of carbon in tight boxes, with the cigarettes still in the paper packages, if the mouth of the packages were left open? If so, would it be necessary to remove the cigarettes to new packages in order to air them and clear them of the fumes of the bisulphide? I ask this as many cigarettes not yet cut could be saved.

The experiments that I have made show that the larvæ and adult beetle in the cigarette can be destroyed with the fumes of the bisulphide of carbon without any injury to the cigarette. My question now is, will the same process destroy the *egg* of the beetle? If so, then the use of bisulphide will be entirely successful. In the case of leaf-tobacco which is packed in large hogsheads, would the fumes settle and permeate through all the leaves, and kill egg, larva, pupa, and adult? Or would it be necessary to transfer to a box with crates in it, so that the leaves could be somewhat separated? The process of steaming and cutting in preparation of the cigarette tobacco does not seem to destroy the young. * * *—[Geo. F. Atkinson, Chapel Hill, N. C., January 11, 1886.

REPLY.—In reply to yours of the 11th instant, I would state that the insect which you send is a species which is found all over the world, feeding in Cayenne pepper,

spices, tobacco, and other pungent substances. It is *Lasioderma serricorne*. This injury to cigarettes has been observed in other localities, and samples of damaged goods have been sent to the Division before. In tobacco warehouses in Baltimore particularly it has done much injury to cigars and cigarettes, preferring the latter. It is very abundant one year and then disappears almost entirely for a number of years. It is a night flyer, and enters store-houses through open windows or cracks at night only. The best way to destroy the larvæ and eggs is to thoroughly steam all the tobacco. The steaming which is done in the preparation of cigarette tobacco is either not thorough enough or the tobacco is left for a longer or shorter time after steaming and before being made up, and in this interim the beetles enter it. Many precautions should be used. Cut tobacco should be kept in tightly-closed boxes when not in use. All manufactured cigarettes should be packed up at the close of the day's work, or if this be not possible, they should be closely covered with flannel cloth. All the windows in the building should be closed at night, and its general cleanliness should be carefully looked after. No dust heaps should be allowed to accumulate, and the walls should be kept whitewashed. The bisulphide of carbon would hardly be a safe or pleasant remedy in this case. It would be of considerable interest if you would carefully rear the insect and note its habits and natural history, particularly the length of time of the different larval stages and the number of annual generations. —[January 18, 1886.]

Injury by the Fall Web-worm in Texas.

* * * The "Fall Web-worm" has been doing great damage to the trees on this island, more this year than formerly, owing, I presume, to the little attention that has been paid here to its ravages. It seems to prefer the leaves of the Mulberry. I have two large Black Mulberry trees, which the Web-worms would defoliate in a week, but I have kept the numbers down by cutting off the branches as I noted the webs on the leaves. The worms are now coming out for the third time this season.—[E. P. Clegg, Galveston, Tex., September 3, 1888.

Dryocampa imperialis on Elm and Linden.

I herewith send you a larva that I have never seen before. It feeds on the Linden tree, Norway Spruce, and Elm tree. I can not find it in any book I have. It is about the size of the Cecropia Silk-worm (*Attacus cecropia*), has long white hairs all over it, and the warts are yellow. Please send me the name of it if you can.—[Victor Braidwood, Vineland, N. J., September 10, 1888.

REPLY.—* * * The worm sent is the larva of the Imperial Moth (*Dryocampa imperialis*). It is known to feed on the Button-wood or Plane-tree, Sweetgum, Alder, Willow, Pine, Spruce, Tamarack, but is not included in Packard's Report upon Forest Insects, Bulletin 7 of the U. S. Entomological Commission, among the enemies of the Elm or Linden; so this fact may prove of interest. The caterpillars attain their full size from the middle of August to the last of September, when they descend from the trees to go into the ground. The moth appears in June and is of a fine yellow color, sprinkled with purple-brown dots, with large patches at the base of the wings, and with smaller spots near the middle and a wavy band of purplish-brown toward the hind margin of each wing. It expands from 4½ to 5 inches.—[September 12, 1888.]

Larvæ of Tenebrio molitor in a Woman's Stomach.

I send herewith inclosed one of a couple of insects claimed to have been ejected from the stomach of a woman in an adjoining county, and sent me for diagnosis and treatment. It is not an Entozoa that I know or can find any information about. Please examine, name, classify, and tell me its habitat.—[John S. Apperson, M. D., Glade Springs, Va., April 30, 1889.

Reply.—I beg to acknowledge the receipt of your interesting letter of the 30th ultimo. The specimen which you send is the common Meal Worm (larva of *Tenebrio molitor*). This is a common insect all over the world, feeding in corn meal and flour, and it is not unlikely that the story of its ejection from the stomach of a woman is correct. You can readily conceive how the larva could have been swallowed by her in corn-meal mush, which she naturally would not chew, and it is also readily conceivable that the worm would disagree with her and would cause vomiting. Such cases have been previously placed on record, and, though always interesting, are not remarkable.—[May 2, 1889.]

Another Note on the retarded Development of Caloptenus spretus Eggs at Manhattan, Kans.*

In 1874 Kansas was devastated by *Caloptenus spretus* (as you know), and much was published upon the subject, true and false. At the time I made many careful examinations of them on my farm in Marshall County; their eggs, etc. At that time, *after* they had deposited their eggs all over, the Agricultural College at Manhattan, Riley County, Kansas, had occasion to build a small blacksmith-shop on a plat of bare ground. This shop was used till the summer of 1880. In August of 1880 I conducted the Riley County "Teachers' Normal Institute" at Manhattan, and visited the "Agricultural College" daily. During that time the authorities had occasion to take down and remove the blacksmith-shop above-mentioned, and, lo! the ground covered by a floor was perfectly full of grasshopper (*Caloptenus spretus*) eggs. To see if they were still vital, we gathered great quantities of them and placed them in the sun, and they hatched the true insect—*Caloptenus spretus*. Placing some in gauze-covered boxes, I raised many through all stages to maturity, thus showing that the eggs deposited in 1874 had retained all their vitality under that building until 1880, or six years; for there had been none on that ground during that interval.—[F. W. Parsons, California, Mo., July 15, 1886.

Reply.—* * * Are you perfectly sure of your dates in the case of retarded development of the eggs of *Caloptenus spretus?* Cases almost parallel to this are on record, as you will see if you will consult the American Naturalist for 1881, pp. 748 and 1007. One of these instances is reported by a Manhattan man, Mr. I. D. Graham, and in this instance the occurrence of the locusts at Manhattan is stated to have been in 1876. Are you sure that the blacksmith shop was built in 1874? It is such an interesting and important observation that you will pardon my desire to be very particular on this point. * * *—[July 19, 1886.]

[Note.—Subsequent correspondence with Mr. Parsons leaves doubt as to the date of building the blacksmith shop, which was probably 1876.]

GENERAL NOTES.

LINEN INJURED BY AGROTIS LARVÆ.

Mr. C. G. Barrett publishes a very interesting article in the March number of the *Entomologist's Monthly Magazine* (London, England), describing the serious damage done to the linen manufacturing industry in the north of Ireland by the larvæ of *Agrotis exclamationis*. The damage is done after the linen is removed from the grass upon which it has been laid out for bleaching. It remains upon the grass for some days or a week, and is then gathered up and laid in a heap, before

* See American Naturalist, vol. 15, 1881, pp. 748 and 1007.

the process of dipping. It is while the linen lies in these heaps that the injury is done. The larvæ unquestionably have crawled upon the under side of the linen while it was stretched upon the grass and have been gathered up with it. At night, being hungry and being confined in the heap of linen and under pressure, they act just as they would when under ground, using their strong jaws to gnaw through the cloth. The remedy proposed by Mr. L. M. Ewart, who investigated the subject and who was Mr. Barrett's informant, was to place the cloth directly in the dip after removing it from the grass, as no damage seems to have been done at any other time except when the cloth was piled in a heap, never when it is spread upon the grass. As a matter of course a thorough shaking of the cloth would answer the same purpose. Curiously enough the larvæ were found to stand immersion in the dip (a weak solution of chloride of lime) for several hours without apparent injury.

IMPRESSION OF AN INSECT IN PAPER.

A curious case of an impression of an insect in a piece of paper has recently come to our notice. Mr. John R. Giles, vice-president and general manager of the Giles Lithographic and Liberty Printing Company of New York, has sent us a piece of transfer paper of rice manufacture made in India, which contains a most perfect impression of a species of Lithobius, a genus allied to the Centipedes. All parts of the insect are readily discernible, and it is incorporated in the substance of the paper and forms a part of it. The specimen was no doubt accidentally entrapped in the pulp while the paper was in the process of manufacture, and passed unnoticed through the rollers in the subsequent stages of drying.

THE DESTRUCTIVE LEAF-HOPPER INJURING TIMOTHY.

Our former Missouri agent, Mr. J. G. Barlow, writes us under date of April 29 that some Timothy meadows in the vicinity of Cadet are infested by millions of small, dark-colored leaf-hoppers, specimens sent proving to be *Cicadula exitiosa.* They have already injured the grass to a considerable extent, and though so numerous are difficult to capture except by sweeping, on account of their extreme shyness and agility. This species was described by Uhler in the third volume of the *American Entomologist*, page 72. There is also an account on page 78 of the same volume of their infesting wheat fields in myriads in North Carolina from October, 1879, to January, 1880. In the Annual Report of this Department for 1879, pages 191 to 193, a full account of the insect and its destructiveness is given and special reference made to the above cases of damage in North Carolina, which were laid to the extreme mildness of the winter of 1879–'80. The species has heretofore been noticed as injurious only to winter wheat, to which Timothy grass may now be added.

THE SUNFLOWER A FOOD PLANT OF RHODOBÆNUS 13-PUNCTATUS.

In vol. 1, No. 6, p. 198, of INSECT LIFE, under the head of "The Food-habits of North American Calandridæ," only *Xanthium strumarium*, *Ambrosia*, and Thistle are given as food plants of this beetle. I found the larva of this species burrowing in the pith of the common garden Sunflower on August 21. There was a hole through the woody walls covering the pith, but whether bored from within or from without I could not determine, but suppose it must of necessity have been excavated from within, as it was located some distance from the ground. The larva, still within its burrow, was placed in a small box and the adult beetle found therein on September 8th, following.—F. M. WEBSTER.

PIERIS RAPÆ AND PROTODICE IN COLORADO.

We notice that Professor Cassidy, in a late bulletin of the Colorado Experiment Station, says that the Southern Cabbage-butterfly (*Pieris protodice*) is the most injurious of the Cabbage butterflies in Colorado, mentioning also *P. oleracea*, *Plusia brassicæ*, and *Ceramica picta*, but leaving *P. rapæ* entirely out of consideration. Scudder, in his paper on the introduction and spread of *P. rapæ* in North America, gives the year 1886 as the date of its introduction into Colorado. A dozen specimens were taken by Mr. David Bruce in the vicinity of Denver between August and October of that year. Inasmuch as *rapæ* usually practically replaces *protodice* in a year or so after its introduction, it seems rather remarkable that now in 1889, three years afterwards, *protodice* should still be the most injurious species in the State, and that in an account of this kind *rapæ* should not even be mentioned.

LIGYRUS GIBBOSUS INJURING CARROTS IN INDIANA.

On September 5, a plat of Carrots on the grounds of the Indiana Experiment Station was examined and the roots of the plants, from the surface of the ground downward to the depth of 2 or 3 inches, were found to have been gnawed, the cavities thus formed being large, irregular, and seldom extending inward beyond the cortical.

Further investigation revealed the depredators to be the adult beetles of this species, usually two and sometimes four being found about one plant, although comparatively few plants were affected, and the depredators were not very abundant. The injuries continued during the remainder of the month and October, but up to the 6th of December, when we left for Australia, we had not succeeded in securing eggs or witnessing oviposition, although both sexes of the beetles had been kept about potted plants. The crop was not seriously damaged, owing, no doubt, to the limited number of beetles.

The only other recorded notices of the destructive habits of this species are to be found in the Report of the Commissioner of Agriculture for 1880, p. 274, where the beetles are accused of destroying the garden

Sunflower, wild Sunflower, and Dahlias in Nebraska, and the larvæ of becoming quite injurious to potatoes in Texas.—F. M. WEBSTER.

THE SCURFY BARK-LOUSE UPON THE CURRANT.

Prof. Herbert Osborn has written us in reference to our statement, upon page 324 of No. 10 of INSECT LIFE to the effect that Currant had not previously been recorded as a food plant of *Chionaspis furfurus*, and that he had found it upon this plant in Iowa, and had mentioned it upon page 95 of the Bulletin from the Department of Entomology of the Iowa Agricultural College for 1884.

PHYLLOXERA AT THE CAPE OF GOOD HOPE.

We learn from the April number of *Garden and Field* that the Phylloxera is abroad in fifteen centers in the division of Stellenbosch and in two centers in the Cape division of Cape Colony. Bisulphide of carbon is being brought by the ton from England for use in treatment.

WHITE ANTS IN FENCES.

Prof. G. F. Atkinson records in a recent bulletin of the South Carolina experiment station the fact that long stretches of the board fences on the outskirts of Columbia have been seriously damaged by White Ants. The principal damage is done to the boards where they meet on the posts. It is particularly noticeable where a batten is nailed on at the joint. Professor Atkinson states that tar poured between the post and the boards soon after building the fence will act as a preventive.

A NEW BUTTERFLY PUBLICATION.

We have just received from Mr. A. Sidney Olliff of the Australian Museum, a copy of a little pamphlet of fifty pages entitled "Australian Butterflies: A brief account of the native families with a chapter on Collecting and Preserving Insects." The pamphlet is profusely illustrated with wood-cuts and the chapter upon collecting and preserving is valuable.

THE BOT-FLY OF THE OX.

We are glad to notice that the *Farmers' Review*, of Chicago, is undertaking an investigation relative to the damage to cattle and their hides from the larva of the Bot-fly of the Ox or Ox Warble-fly. The investigation is undertaken by means of circular, and the following specific questions are asked:

1. Are grubs common on the backs of cattle in your county?
2. What damage do they do?
3. Do buyers "dock" cattle in your locality on account of the grubs? If so, what loss in dollars and cents does this amount to on sales in the grubby season?

4. Do farmers realize that grubs are a great damage to their stock, and endeavor to prevent the trouble?

5. If any remedies have been used, state their nature and whether successful or not.

6. What proportion of beef cattle marketed from your county are afflicted with grubs?

7. What amount does your local hide-buyer deduct from the purchase price of a grubby hide?

8. What class, sex, age, or breed of cattle are most troubled by the grubs?

We shall be glad if any of our correspondents will take the trouble to answer these questions direct to Mr. A. S. Alexander, of the *Farmers' Review*, 134 Van Buren street, Chicago, Ill.

A NOTE ON MUSEUM PESTS.

In INSECT LIFE No. 7 (p. 222), Mr. John P. Brown notes the ravages of *Anthrenus varius* upon whalebone at Boston.

The same industrious little insects attacked the baleen belonging to one of the mounted whale skeletons in the National Museum and did some little damage before their presence was noted and a stop put to further depredations by liberal douching with a solution of arsenic.

Anthrenus is a dangerous pest on account of its small size and predilection for horn and feathers, but for downright mischief *Dermestes* is by all odds the worst enemy of zoological material, promptly putting in his appearance on every skin or rough skeleton that may have escaped the poison bath.

Dermestes maculatus is the species now on watch at the National Museum, and the writer thinks, though it is merely a matter of individual opinion, that this insect has completely driven away the weaker *D. lardarius.*

D. lardarius is by no means to be despised, but *maculatus* far exceeds it in strength and vigor, seeming to attack some objects merely for the purpose of displaying its destructive powers.

In several instances boxes used for the storage of skeletons were perforated by the lively larvæ until they looked as if riddled by shot, and crumbled to pieces in the hand.

The most curious object attacked by these insects, however, was a plaster mold made over the head of a some time dead monkey and stored away for the purpose of being used when the said monkey was mounted.

When taken down the mold was found to be pitted in many places by *Dermestes*; the dead bodies of larvæ fitted into the holes they had sunk in the flesh-tainted plaster leaving no doubt as to the origin of the pits.

Perhaps the palm should be awarded to the larvæ that bored through the side of a pasteboard box containing chloride of lime and succeeded in burrowing 2 inches deep in it before giving up the ghost.—F. A. LUCAS, *U. S. National Museum, Washington.*

THE PHYLLOXERA IN COLORADO.

Mr. Eugene Weston, of Cañon City, Colo., informs us by letter that there is some danger of the Phylloxera becoming a dangerous enemy in that part of Colorado. One of the vine-growers of his vicinity, evidently a man of conscientious principles and a good neighbor, found the Phylloxera in a lot of California vines that he had purchased, and at once dug up and burned six hundred valuable grape roots which he feared might be infested. But a leading nurseryman of the same place has been charged with sending out large quantities of vines this season which had been imported from California and showed indubitable signs of the disease. Mr. Weston informs us that the results will be closely watched and the necessary legislation secured if found expedient.

THE RHIZOCOCCUS ON GRASS.

Mr. James Fletcher, Dominion Entomologist of Canada, sends us some specimens of the egg sacs of a Rhizococcus on grass, which he received from a correspondent, Mr. A. H. McKay, of Pictou, Nova Scotia. They were found in large numbers over an extensive marshy flat in Cumberland County, Nova Scotia, every blade of dead grass having a Rhizococcus attached to it. This is the same species which is mentioned on page 345 of INSECT LIFE, Vol. I, as occurring on grass in Custer County, Dak., and this locality is the only one from which we had previously received it. It is undoubtedly a new species of this remarkable genus. Mr. Fletcher inclosed also with the specimens a dipterous parasite, which proves to be a species of Leucopis. The parasitism of this genus on Coccidæ is mentioned in a note on page 258 of the same volume of INSECT LIFE.

A NEW GRAPE PEST IN THE SOUTHWEST.

A beetle new to entomological literature in the role of a grape pest has been sent to us from Arizona by one of our correspondents, Mr. William J. Howerton, of Florence, Pinal County. It proves to be *Gastroidea formosa* Say, one of the Flea-beetles, of which the habits have not been previously recorded. The eggs from which proceed the only brood so far determined are deposited in January and February, in clusters on the under side of the leaves of the Cañagre or Tuberous-rooted Rhubarb, a native plant of Arizona, and the beetle's natural food plant. The imagos appear in great numbers in March and the early part of April, when they attack the leaves of the grape, and this year have done considerable damage to vineyards in Pinal County. Some vines are greatly damaged while others near by may be scarcely touched, and whole vineyards are apparently exempt while others within a quarter of a mile are considerably infested. At the date of our correspondent's letter, May 18, the beetles had relaxed their attacks upon the grape leaves and disappeared, nor were any eggs or larvæ to be found at that

time. The remedy, of course, will be to spray the Cañagre, upon which the beetles breed, with one of the arsenical mixtures, at the time when the larvæ are in full force feeding upon the leaves, which is February and March in Arizona.

AN ALEURODES ON TOBACCO.

Prof. P. Gennadius, Director of the Bureau of Agriculture, Ministry of the Interior, Athens, Greece, wrote us under date of March 25 that he had found an Aleurodes on the Tobacco plant, a description of which he had recently published in a Greek journal which we have not seen. We can not at present tell whether Professor Gennadius named the species, though we infer not. He wrote us later (May 21), sending samples of the leaves infested with the Aleurodes of the Tobacco plant. These present a whitish-speckled appearance from the abundance of the small insects covering them. In this last letter he writes that the insect has caused a good deal of damage to the tobacco plantations of the valley of Trichonia. It has been observed that after continued rains it disappears, probably being washed away in numbers, as it is a very small and delicate insect. It thrives and multiplies rapidly, however, in dry weather. Plants growing in poor soil show its attacks earlier. The attacked leaves become nearly useless, acquiring a very bad taste.

A CORN ROOT-WORM IN SOUTH CAROLINA.

The larva of *Diabrotica 12-punctata* has been sent to us by Dr. J. W. Thomas, of Abbeville, S. C., with the statement that it was taken imbedded its full length, head up, in the heart of a stalk of corn at the base. He writes that this insect cost him at least 100 bushels of corn in the year 1857, and is this year damaging the stands of corn generally. In 1887 it was confined to the bottom lands, but now the uplands are attacked. Sandy bottoms are exempt. Corn planted before the 1st of April was not injured much, but all planted in April seriously damaged. It is likely also that corn planted even as late as June would not escape its ravages. A strong top dressing of lime would help to reduce its numbers, and to let the land lay in fallow through one summer, when it can be spared, will starve out the majority of them. The most practical idea that can be suggested for this insect is to spray all cucurbitaceous plants in the vicinity of corn-fields later on in the season with a dilute arsenical solution, with the view of destroying the perfect beetles, which would otherwise winter over and deposit their eggs about the corn roots the following spring.

A DEER BOT FLY.

We have received, through the kindness of Mrs. A. E. Bush, of San José, Cal., specimens of the larva of a bot-fly infesting the deer. The larvæ sent were taken from a pocket under the jaw of a yearling deer from Humboldt County, Cal., and as nearly as can be determined belong to an undescribed species of the genus *Cephenomyia*. The

pockets in which these larvæ are found do not show from the outside, but are seen as soon as the hide is removed, generally just where the head and neck join under the jaw. In the animal referred to there were two pouches or pockets on one side, one lower than the other, an unusual case, as there is generally one on each side. The popular account given by old hunters is that the eggs are deposited by a fly which enters the head, probably by the nostrils. One deer's head examined had the pocket of larvæ between the ear and the upper jaw, with an opening into the tube at one side of the glottis, opening into the mouth near the roof. This is an insect of much interest, and we rely on our correspondent to secure further specimens alive and to endeavor to breed the fly.

THE SHIELD METHOD FOR LEAF-HOPPERS.

Mr. Eugene Weston, of Cañon City, Colo., secretary of the Fremont County Horticultural Society, writes us of the success of the following plan for combating the Grape-vine Leaf-hopper: Four lath nailed in a square and suitably braced are covered with drilling, which is then smeared over with the residuum of petroleum remaining after the kerosene is distilled off, which is easily obtained in quantity from the local oil-wells in that vicinity. One man carries the frame while another raises the vines, thereby disturbing the leaf-hoppers, which fly against the shield, and are thus destroyed by millions. The best time for the operation was found to be just before or near sundown and nightfall, as the temperature rapidly cools there at that time of the day. It should not be so warm that the hoppers fly, nor so cool that they fall at once to the ground. If the frame is held at a slight angle and as near as possible to the vines, they will hop on it in myriads. The operation must be rapidly and thoroughly performed, and repeated as often as the hoppers again become numerous.

This plan has also been used by grape-growers in California and New York, with considerable success, during 1887 and 1888.

LORD WALSINGHAM'S INDEX.

In our next number we shall resume the publication of Lord Walsingham's "Steps towards a Revision of Chambers's Index, with Notes and Descriptions of new Species." The next number will begin with the genus Lithocolletis. We regret that we have not been able to publish this valuable work in consecutive numbers of INSECT LIFE, but we have received the copy in installments, and the distance in time between Washington and England has rendered it impossible.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

June 6, 1889.—Mr. Ashmead read a letter, which he had recently received from Mr. D. Redmond, of St. Nicholas, Fla., in confirmation of his (Ashmead's) statements regarding the leaf-eating habits of a Florida spider made at the meeting of the society in December last (INSECT LIFE, Vol. I, p. 200). Mr. Redmond wrote that the destruction of the trees, which occurred in the spring and early summer, was effected by the spiders eating all the thick portion of the leaf, as a silk-worm eats the mulberry, and also by gumming up and sticking the leaves together by means of some adhesive secretion. Dr. Marx held that while the spiders might cut off the leaves and web them together, a study of the mouth parts makes it questionable whether any spider is phytophagous, which opinion was also held by Mr. W. M. Wheeler. Mr. Howard thought that Tortricid larvæ, probably abundant but overlooked, had attracted the spiders.

Mr. Schwarz read and commented on portions of a letter by Henry Stanley to the Royal Geographical Society of England, referring to certain insects observed in Central Africa—a small gray caterpillar (*Lagoa?*) and a spider (*Theraphosidæ*)—and to poisoned arrows used by the natives, the poison of which is obtained by boiling the dried and powdered bodies of red ants in palm oil.

In a note on Brood VIII of the Periodical Cicada Mr. Schwarz recorded its appearance, May 19–21, this season in limited numbers at Harper's Ferry, District of Columbia, and in Alexandria County, Va. At Harper's Ferry all the Cicadas seen were on a clearing surrounded by woods, and Mr. Schwarz pointed out that under such conditions the development of the Cicadas is no doubt accelerated by the increased warmth of the soil within the clearings.

Mr. Schwarz also presented for publication a paper recording the food habits and food plants of a number of Coleoptera, chiefly *Rhynchophora*.

Dr. Marx read a paper on the morphology of *Filistata capitata* Hentz., in which he described a remarkable comb-like organ on the inner surface of the inferior spinnerets which has the function of an accessory *calamistrum*. He also made some observations on the value in classifications of the three or four stigmatal openings to the lungs, dividing the *Araneina* into *Tri-sticta* and *Tetra-sticta*. He had found a rudimentary fourth stigma in the species under consideration, showing that it had hitherto been wrongly placed in the first of the groups mentioned. The paper was accompanied by careful drawings illustrating the various points discussed.

C. L. MARLATT,
Acting Recording Secretary.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. VOL. II.

JULY, 1889, to JUNE, 1890.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE.

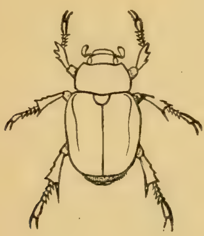
EDITED BY

C. V. RILEY, Entomologist,

AND

L. O. HOWARD, First Assistant,

WITH THE ASSISTANCE OF OTHER MEMBERS OF THE DIVISIONAL FORCE.



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PERSONNEL OF THOSE ENGAGED IN GOVERNMENT ENTOMOLOGICAL WORK.

The following list embraces those now engaged in Government entomological work, and who will assist in the management of the periodical; those at Washington editorially, and the others as contributors. The force of the Division of Entomology is more or less inconstant, as it consists of both permanent and temporary employés:

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☞For bibliographical purposes it may be necessary to state that, where expedient, the names or initials of members of the force will be attached to their communications. Where initials alone are appended, the full name can be ascertained by referring to the list above given. Illustrations, where not otherwise stated, are drawn by Miss Lillie Sullivan, under supervision.

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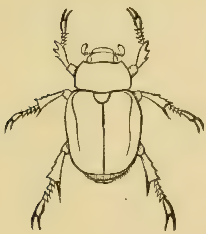

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SPECIAL NOTES.

With this number we commence the second volume of INSECT LIFE. The last number was somewhat delayed by the preparation of the extensive indices, which, however, we feel will greatly increase the value of volume I. Largely through the kindness of the authorities of the Government Printing Office we were able to print the numbers during the past year more regularly and promptly than we had anticipated, and we hope to continue this regularity through the coming volume. As stated in the salutatory to the first volume, however, the force of the Division of Entomology is so actively engaged during the larger part of the year with field work and experimentation that some lack of promptness in publication can not but ensue. The publication of the bulletin met with even more favor than we had hoped at the start, and almost no adverse comments have reached our eye. The only criticism which we have noticed was published in the review column of the *Atlantic Monthly*, in which slight exception was taken to the idea of the publication of a magazine by the Government, which by its free distribution would compete on unfairly advantageous terms with private enterprises. We have no comment to make except that the various branches of the Government are constantly publishing bulletins, many of which differ but slightly in character from this, so that if the title-page were only slightly changed, INSECT LIFE would escape all criticism of this kind. We trust that the interest of our readers will continue, and that the tendency which INSECT LIFE has so far shown, to increase the correspondence, and therefore the range of benefit of the Division of Entomology, will also continue.

South African Insects.—That indefatigable worker, Miss Eleanor A. Ormerod, has just brought out privately a little work entitled "Notes and Descriptions of a Few Injurious Farm and Fruit Insects of South Africa." The book is published by Simpkin, Marshall & Co., of London, and the price is 2*s.* 6*d.* The descriptions and identifications of the

insects are by Mr. Oliver E. Janson, and the species are figured in nearly all instances. Many items of interest strike us in glancing through the pages, and while many of the species seem to be vicarious with our own in the damage which they do, but one (barring scale insects) seems to be identical with any American injurious species. This is the Diamond-back Moth (*Plutella cruciferarum*), which damages cabbage in the East Province. The Fluted Scale (*Icerya purchasi*) of course occupies a considerable space, while the Flat Scale (*Lecanium hesperidum*) is also mentioned.

Among the vicarious pests may be mentioned the Orange Fly (*Ceratitis citriperda*), which damages oranges in the same way as does the Morelos Orange Fly (*Trypeta ludens*—see INSECT LIFE, August, 1888, page 45); the Orange Butterfly (*Papilio demoleus*), which works upon the foliage of the Orange in the same way that the Orange Dog (*Papilio cresphontes*) works in Florida; the Bean Seed-weevil (*Bruchus subarmatus?*), which damages beans just as does the Bean Weevil (*Bruchus obsoletus*) in America; a large Cantharid (*Mylabris oculata*), which injures beans and peas in a similar manner to the damage done by Meloids in the West; and the Cetoniid (*Rhabdotis semipunctata*), which injures figs and peaches just as does the "Fig Eater" (*Allorhina nitida*) in our Southern States.

Professor Forbes' Correction.—We are glad to make room in this number for an article received from Professor Forbes which corrects a statement in the article on the Plum Curculio in the Annual Report of the Department for 1888. Our information in the Annual was derived from a newspaper report which we supposed reliable.

A Phase of Buffalo Gnat Injury.—A report by Mr. Marlatt on a trip made in April, published in the present number, is comparatively interesting as indicating an unexpected result of certain operations by the Army engineers. We have already published Mr. G. A. Frierson's letter concerning this peculiar case (see INSECT LIFE, April, 1889, Vol. I, page 313), and in the light of Mr. Marlatt's observations our opinion there published is confirmed. It is a hard case, and the only remedy can come through Congress in the shape of an item in the river and harbor appropriation bill.

Bibliography of American Economic Entomology.—The first part of this long-delayed work is now being printed, and the second part will probably be in the printer's hands by the close of the year. The preparation

of this work has been in the hands of Mr. Samuel Henshaw, of Boston, for the past two years, and the first part, just now being printed, comprises the writings of B. D. Walsh and C. V. Riley.

Bulletin on Root-knot Disease in Florida.—This bulletin, mentioned in our Special Notes in the last number of INSECT LIFE, has been delayed for the plates, which the printer could not have executed until after July 1. We hope soon, however, to have it ready for distribution.

ARSENICAL POISONS FOR THE PLUM AND PEACH CURCULIO.

By S. A. FORBES.

The following report of results of my recent experimental work on the common peach curculio is intended to correct and complete a reporter's summary of remarks made in August, 1888, at a meeting of the Central Illinois Horticultural Society, at Champaign, as republished in the last Report of the U. S. Entomologist, page 75. The experiments there alluded to were not generalized by me, but were described as merely preliminary to a much more elaborate series which I have since carried through.

The object of these experiments has been to ascertain some details of the food and feeding habits of the curculio and to test its sensibility to arsenical poisons when distributed on the trees which the insect frequents. In the case of the peach it was important also to find what amount of these poisons the leaves might receive without marked injury.

FEEDING EXPERIMENTS.

June 15, 1888, plum curculios confined with plum leaves. June 16, one observed making a deep, sharp, oblong excavation in the midrib; similar work on other midribs, petioles, and stems. Beetles also seen gnawing the surfaces of the leaves, especially the fresher terminal ones. Leaves removed and green plums substituted. June 19, plums peppered with holes, some containing eggs, others not. July 2, fresh lot of beetles imprisoned with both leaves and green plums. The next day both had been eaten, the plums perhaps the more freely.

Several examples taken April 14, 1889, before peach trees were in bloom, were proven by dissection to have last fed on dead vegetation, as shown by the absence of chlorophyl and the presence of some of the fungi of decomposition. Curculios confined April 19, with both dead and living peach leaves, fed only on the latter, not having touched the dead leaves at the end of three days. Peach blossoms being placed in the cage, with fresh leaves also, April 22, both were freely eaten at once, the blossoms being, however, evidently preferred. Both calyx and

corolla were perforated with small round holes, and eaten away from the edge.

Three specimens taken in southern Illinois were dissected April 23, and found to contain vegetable tissues, chiefly of leaves (as shown by the fragments of spiral vessels), without fungi and with more or less chloryphyl. Vegetable hairs and peculiar pollen grains, not those of fruit blossoms, were also recognized.

Thinking it possible that the curculio might feed on flowers somewhat indiscriminately, we put a number under a bell glass with roses in full bloom. The next day, May 19, the petals were much eaten, and two days later calyx and peduncles had likewise been attacked. The rose leaves were not injured. When rose blooms and peach leaves together were offered the imprisoned beetles, they fed freely on both.

Again, May 23, curculios were confined with both bush honeysuckles and snowballs in blossom. The next day the honeysuckle blossoms were eaten, and on the second day those of the snowball also. On the other hand, beetles shut up with peach leaves and peony flowers ate the peach at once, as usual, but refused the peony entirely, not having eaten it at all after ten days.

INSECTICIDE EXPERIMENTS.

My first experiments with insecticides for the curculio alone were made July 6, 1888. Two lots were placed under glass, with leaves and green fruit of the plum, the food of one being sprayed with Paris green, 1 pound to 50 gallons of water, and the other not. The first beetle died in the poisoned lot July 9, and the next day all were dead, the check lot continuing without loss. July 28 a similar experiment was made with Paris green, 1 pound to 100 gallons, applied until the leaves began to drip. The poisoned beetles commenced to die the next day, and five of the six were dead on the 31st. In the check lot of six, on the other hand, only one was dead.

An experiment begun with 1 pound to 200 gallons was unavoidably suspended in two days, before results were reached.

Next, April 19, 1889, a lot of curculios, greatly exhausted by long confinement in transit, were divided into five lots—the first, of twenty-four, a check; the second and third of twelve each, the fourth of nine, and the fifth of twelve. The food of the second lot was treated with Paris green mixed with water at the rate of 1 pound to 100 gallons; that of the third, with a pound to 200 gallons; the fourth, a pound to 300, and the fifth, a pound to 500 gallons.

The previous hardships of the check lot caused many of them to die, most of them having been insensible, in fact, when first released; but the effects of the poisons were nevertheless evident, as shown by the subjoined table:

Paris-green experiment No. 1, *April* 19, 1889.

Died.	Check lot. Number used, 24.	1 lb. to 100 gals. Number used, 12.	1 lb. to 200 gals. Number used, 12.	1 lb. to 300 gals. Number used, 9.	1 lb. to 500 gals. Number used, 12.
April 22	....	3	3	1	2
23	2	2	....	2	3
24	1	2	3	2	1
25	....	2	4	2	3
26	3	1	2	....	1
27	2	2	....	1	1
29	2	....	....	1	1
Total	10	12	12	9	12

May 4 this experiment was repeated with a fresher lot of beetles, with more marked results, curculios commencing to die two days after treatment in all the poisoned lots but one, all of one lot being dead in nine days, and in ten days all of every poisoned lot but a single beetle. In the check lot, meanwhile, only one had died.

Paris-green experiment No. 2, *May* 4, 1889.

Died.	Check lot. Number used, 12.	1 lb. to 100 gals. Number used, 12.	1 lb. to 200 gals. Number used, 12.	1 lb. to 300 gals. Number used, 22.	1 lb. to 500 gals. Number used, 22.
May 6	....	3	2	....	1
7	....	1	....	4	2
8	....	1	2	2	1
9	....	2	3	3	3
10	1	3	1	4	4
11	....	1	....	6	4
13	....	....	4	2	5
14	....	1	....	1	1
Total	1	12	12	22	21

In both the above experiments, as also in the following, peach leaves were used as food, and these were sprayed but once.

All strengths of the poison mixture here killed the beetles feeding on it, the difference being seen in the rapidity with which they took effect. In four days from poisoning the ratios killed were 42 per cent. in lot two, 33 per cent. in lot three, 27 per cent. in lot four, and 18 per cent. in lot five.

Finally, May 17, a still more extensive experiment was begun with London purple, three hundred and forty-seven curculios being divided into five lots as before, their treatment differing from that of the foregoing only in the substitution of London purple for Paris green. The results were rendered, however, somewhat less satisfactory by the lateness of the season, which probably accounts for the number of deaths in the check. Other parallel observations led to the conclusion that spent

adults, doubtless the earliest to emerge, were already beginning to die spontaneously. The experiment was continued for eight days, when all the curculios of the first lot were dead, and nearly all of the other poisoned lots, a fourth of the check having also perished.

London purple experiment, May 17, 1889.

Died.	Check lot.	1 lb. to 100 gals.	1 lb. to 200 gals.	1 lb. to 300 gals.	1 lb. to 500 gals.
	Number used, 47.	Number used, 100.	Number used, 100.	Number used, 50.	Number used, 50.
May 19		35	37	16	12
20		18	19	4	6
21	1	18	10	2	4
22		10	11	9	10
23	5	5	7	7	8
24	4	6	5	3	5
Total	10	92	89	41	45

EFFECT ON THE FOLIAGE.

It is well known to fruit-growers that the leaves of the peach are much more sensitive to the scorching effect of the arsenical poisons than those of the apple or plum, and it is important to know just how strong a mixture of the common arsenical insecticides that tree will bear under favorable, and also under unfavorable, conditions. My experiments on this point are incomplete, but they are given here for what they are worth:

First. Two branches of a peach tree were sprayed May 18 with London purple mixtures, a pound to 100 and a pound to 200 gallons, respectively. A week later no noticeable difference could be made out between the condition of the two branches, the tips of the leaves in both being somewhat deadened and dry. May 20 identical applications were made, with no apparent effect on the foliage by May 22. Heavy rains followed, and no further observations were made.

June 6 two other branches were sprayed as before. A heavy rain followed June 8, and more upon the 9th. On the 10th the effects of the poison were somewhat apparent on both branches, reddish discolorations occurring where the fluid had gathered in drops and also along the margins of the younger leaves. Further rains occurred on the 16th and 17th. On the 18th the discolored spots had increased in size, those on the branch sprayed with the stronger solution being somewhat larger and more numerous. No leaves had fallen, but those worst affected were easily detached, and doubtless would have fallen eventually. This loosening of the leaves was evidently due, not to damage to the petiole, but to premature ripening of the leaf,* consequent on the chemical injury to the blade. June 8 two other branches were sprayed

* Ascertained by studying sections of the petiole.

as before, substituting Paris green for London purple in both mixtures. Light rain followed the same day, and more on the 9th. On the 10th a scorching of the leaves was somewhat evident, a little more so where the stronger mixture was used, while on the 18th the condition of the foliage was practically the same as on those branches treated with London purple—if anything, a little less severely injured. There was also a barely perceptible difference in favor of the weaker mixture. Supposing that all the worst injured leaves were rendered practically useless to the tree, the loss of foliage would probably amount to 4 or 5 per cent.

There can certainly be no further question of the liability of the curculio to poisoning by very moderate amounts of either London purple or Paris green while feeding on the leaves and fruit of peach or plum; but much additional experiment is needed to test the possibility of preventing serious injury to these fruits by this means. The pupal hibernation and late appearance of a considerable percentage of the curculios make it possible that sprayings must be several times repeated, and perhaps carried further into the season than is consistent with safety; and the limit of tolerance of these poisons by the peach under ordinarily trying circumstances has not been clearly ascertained. Further, the observations above reported on the food plants of the curculio make it likely that, in nature, a smaller proportion of the food of these beetles comes from the peach or plum than has hitherto seemed probable, and that poisons there applied would kill less certainly. It seems worth while to make the attempt to attract the adult to flowering plants in the orchard other than the peach, with the hope of poisoning it there (especially late in the season) without using these dangerous insecticides on fruits afterwards to be eaten.

REPORT OF A TRIP TO INVESTIGATE BUFFALO GNATS.

By C. L. MARLATT, *Assistant.*

WASHINGTON, D. C., *April* 22, 1889.

SIR: In accordance with your letter of instruction of April 5, 1889, I proceeded to Frierson's Mill, La., and studied, as far as the conditions would permit, the relation of the raft of logs in Bayou Pierre to the injurious abundance of the gnats in that immediate locality. Examination was also made to determine the feasibility of removing the raft to prevent the further breeding of the gnats thereon.

I wish here to express my thanks to Mr. G. A. Frierson and brothers for their kind hospitality, and for the efficient aid rendered by them in the investigation of the raft and bayou.

Respectfully,

C. L. MARLATT.

Prof. C. V. RILEY,
U. S. Entomologist, Washington, D. C.

As you had surmised would be the case, the Buffalo gnats had already disappeared when I arrived at Frierson's Mill. A few Turkey Gnats

were observed about horses and cattle, but it was evidently somewhat early for this species to be about abundantly.

The severity of the attacks of the Buffalo Gnat the present season was plainly indicated by the general emaciated condition of the cattle and mules—the effect also of the repeated application of oils on the latter being shown on many of them by the loss of large patches of hair. The remains of smudge fires were frequently seen in the vicinity of the negro houses and through the woods. In addition to these visible indication of the *Simulium* attacks was the unvarying testimony to that effect of the planters and negroes questioned, all of whom ascribed the abundance of the gnats to the presence of the raft, and manifested no little anxiety to have the Government take measures to prevent the yearly recurrence of this pest.

As shown in the letter from Mr. G. A. Frierson, and also by my own inquiries, the planters have, from their extended experience with the gnats, learned how to prevent loss of stock, by the use of train oil to which a small amount of sulphur is commonly added for the work animals; and smudge fires for cattle, sheep, etc. But the annoyance during the six weeks of the spring from the immense swarms of gnats, practically stopping field work, and also preventing the stock from feeding, can not be avoided.

As shown later the raft was formed in 1872–'73. The gnats were not especially troublesome, however, previous to the spring of 1885, since which time they have appeared in increasing numbers every year. They seem to have extended the present season 5 to 10 miles out from the bayou, swarming in greater numbers on cleared and particularly on meadow land.

As indicating the abundance and probable source of the gnats the present year, the report of several planters living near the raft is here recorded, viz, that the water in the neighborhood of the logs in the time of the greatest abundance of the gnats seemed to be in ebullition from the great numbers of flies constantly popping to the surface.

A heavy rain on the day of my arrival (April 13) prevented an immediate examination of the raft and bayou, and, unfortunately for my work, the rain continued with increased violence during the night and part of the day following. The bayou became much swollen, rising, in fact, nearly up to the high-water mark of the spring (February and March) floods, and 6 to 8 feet above the level of the few weeks previous, during which the Buffalo Gnats had been abundant. By this means much of the raft, and especially that portion likely to bear evidences of the gnats, either as eggs, larvæ, or cocoons, was covered with water; and as the raft consisted of large logs tightly wedged together, it was impossible to remove them for examination with the means at hand, except in a few instances. The floating portion of the raft was not likely to contain cocoons in any quantity, and larvæ were not found on these logs, although they afforded excellent breeding places in the

numerous whirls of water caused by the rapid current of the stream impinging against them.

Careful and continued search on April 15 over 2 or 3 miles of the lower portion of the raft, near Lake Cannisnia, resulted in the finding of a few isolated cocoons on logs which were partially upright, and thus projected several feet into the water. Logs so placed, and possible of removal for examination, were not commonly met with. Nearly all of the floating logs extended lengthwise on the surface of the water, being submerged but a few inches, and hence did not afford suitable conditions for the cocoons, and if larvæ of the buffalo gnat were on the logs their small size prevented their discovery.

On the day following (April 16) that portion of the raft near Red Bluff was examined, and here again were found excellent breeding places for Simulium larvæ, viz, a swift current striking against the logs and rubbish of the raft forming innumerable whirls and eddies, and somewhat better success attended our search here. On submerged branches, twigs, etc., which projected several feet below the surface of the water and which were evidently raised with the floating lower portion of the raft, were found large numbers of cocoons (some few of which contained pupæ) and larvæ. A few cocoons and larvæ were also found attached to water plants growing from the logs. These specimens were found only where the current set strongly against the raft, this causing the riffles known to be necessary for the larval and pupal existence of Simulium species.

The larvæ and pupæ found proved to be largely if not altogether those of the Turkey Gnat (*S. meridionale* Riley). Many of the larvæ did not exceed 1^{mm} in length, were almost hyaline and apparently but recently hatched (?); others were full grown, and spinning cocoons. These larvæ were found attached to the smaller branches and twigs which were in nearly every instance already thickly crowded with cocoons. It is probable from the association of the Turkey Gnat larvæ with most of the deserted cocoons that the latter had contained the earlier appearing gnats of this species. Some few of the cocoons may have been those of the Buffalo Gnat, as also some of the minuter larvæ, but this could not be satisfactorily determined.

The height of the water prevented any satisfactory examination of the trees and shrubs growing near the bayou, but wherever possible branches or vines so situated and extending into the water were drawn out and examined. No evidence of gnats, however, was found.

Mr. G. A. Frierson has promised to look for cocoons here as soon as practicable. The reported appearance of the gnats coming to the surface in such places in quantity as well as about the raft would indicate that the larvæ had during the spring flood attached their cocoons to such submerged trees and branches. Examination will also be made at low water for further evidences of the gnats on the lower and at

present inaccessible portion of the raft, which is more likely to bear cocoons in quantity than the floating material at high water.*

The relation of Bayou Pierre to the Red River is such, as shown in the report of Captain Bergland contained in the Annual Report of the Chief of Engineers, U. S. Army, Part II, 1885, Appendix U, pages 1487–1493, that in times of high water three-fourths of the discharge of the Red River is through this bayou, and in times of low water but one-fourth. Before the formation of the raft, this very great augmentation of the bayou in high water had no ill effect, but now the water, checked by the raft, floods every spring much of the adjacent low-land, thus furnishing additional foothold for larvæ, and possibly also driving the adults in larger swarms to the higher land.

During the summer months the water is confined by moderately high clean banks and is free from drift, except where such material is held by the raft. This would indicate that the raft is largely responsible for the abundance of the gnats in that locality.

The smaller streams in the neighborhood dry up in the course of the summer, and hence could not breed gnats; however, a number of the principal ones were carefully searched for cocoons or larvæ without the discovery of any evidence of them.

The Buffalo Gnat was reported to be quite abundant on the Sabine River; and it also occurs in less numbers on the Red and Washita Rivers.

The raft in Bayou Pierre originated in the attempt of the United States Government (in 1872–'73) to close Tone's Bayou, which connects Bayou Pierre with the Red River, and to confine the water of Red River to its own channel. A large raft which was being removed from above Shreveport was run into Tone's Bayou and the attempt made to retain it there by means of a boom. This raft and also a second one formed later were entirely swept away by floods and carried into Bayou Pierre, where they are at present lodged. As described by Captain Bergland (l. c.) the raft "extends 5.3 miles above and 2.8 miles below Red Bluff at the mouth of Wallace Lake. The upper portion is fragmentary, of recent formation and loose structure, occupying in the aggregate one-fifth of the area of the water surface. That below is nearly continuous and gradually becomes denser until at its lower end it becomes solidified." This lower portion of the raft has now become almost entirely solidified by the massing of the logs and the accumulation of débris, and trees and shrubs are now growing upon it.

*Mr. Frierson subsequently collected and forwarded to the Department a considerable quantity of material—cocoons, larvæ, etc., from this place, concerning which we quote briefly from his letter of May 3 as follows:

"The water has fallen about 2 feet below its level when the gnats were hatching out. * * * The current is very swift, * * * and I found that every overhanging tree, logs sticking out of the water, and the millions of roots on the bank were literally piastered over with the cocoons for the distance of 2 feet above and below the water."

In the estimates made by the Government Engineers for the clearing of Bayou Pierre, the principal item has been the cleaning out of this lower raft. The removal of this portion of the raft is not now necessary, however, as the water has made for itself a new channel through Bennett's Bayou on the west. This natural change in the course of the stream, and the slow but constant breaking up of the remaining and less stable portions of the raft, will make the clearing of Bayou Pierre at the present time comparatively inexpensive. The raft, even if left to take its own course, would in time go out of itself, and if the work of loosening that portion above Red Bluff should be undertaken in time of high water, the bayou might be freed of logs with little difficulty. Taking the estimates in the report above cited as a basis, $25,000 would probably cover the expense of removing such portions of the raft as is now necessary. The final disposition of the material of the raft would occasion some difficulty. It could, however, be directed into Lake Cannisnia and secured there in still water, beyond the reach of the current of the Bayou Pierre, which crosses this lake. If this were done the gnats would not breed on the raft, and in a short time, by the accumulation of sediment and growth of plants, it would become entirely solidified, as is now the case in its lower portion in Bayou Pierre.

The utility of the stream as a water-way and the reclaiming of much valuable land which would result from such improvement, while having no direct bearing on the question at issue, may still be mentioned as an additional reason for removing the obstruction of logs, if this is thought not to be warranted by the presence of the gnats alone.

NOTES ON NOISES MADE BY LEPIDOPTERA.

By Henry Edwards.

The article by Mr. A. H. Swinton on "Stridulation in *Vanessa antiopa*," published in the last number of "Insect Life," Vol. I, p. 307, has directed my attention to the subject, and I venture to add a few notes on this interesting phase of entomological study. It is not alone among the *Vanessas* that *antiopa* has the power of making a sound, for many years ago in England, when I began to collect butterflies and moths, I observed that the beautiful *Vanessa io*, the favorite of every young entomologist, gave out a slight rasping sound when many specimens were flying together, or when a male was in hot pursuit after the opposite sex. But the sound was very slight and could only be distinguished when "all around was still," and when there was no conflicting influence to deaden the insect's expression of love. The projecting vein which is shown in Mr. Swinton's cut is also quite apparent in *V. io*, and probably is a character of the whole of the genus. Still more remark-

able is the noise produced by various species of the Nymphalid genus *Ageronia*, to which attention was first called by the late Charles Darwin in his "Naturalist's Voyage Round the World." This was his famous expedition in H. M. S. *Beagle*, which enabled him to contribute so largely to our knowledge of the fauna of the various countries visited. During his stay in Brazil he paid considerable attention to entomology, and his notes upon the singular habit of *Ageronia* are worth transcribing in full. He says:

I was much surprised at the habits of *Papilio feronia* (*Ageronia feronia* of later authors). The butterfly is not uncommon, and generally frequents the orange groves. Although a high flier, yet it very frequently alights on the trunks of trees. On these occasions its head is invariably placed downwards, and its wings are expanded in a horizontal plane, instead of being folded vertically, as is commonly the case. This is the only butterfly which I have ever seen that uses its legs for running. Not being aware of this fact, the insect, more than once, as I cautiously approached with my forceps, shuffled on one side just as the instrument was on the point of closing, and thus escaped. But a far more singular fact is the power which this species possesses of making a noise. Several times when a pair, probably male and female, were chasing each other in an irregular course, they passed within a few yards of me, and I distinctly heard a clicking noise, similar to that produced by a toothed wheel passing under a spring catch. The noise was continued at short intervals, and could be distinguished at about 20 yards distance. I am certain there is no error in the observation. (Nat. Voyage, Appleton's edition, p. 33.)

As a boy, I had read this interesting note by the great naturalist, and in the last months of the year 1866 I had, during a stay of four weeks in Panama, the opportunity of observing for myself this curious butterfly habit. The species *Ager. feronia*, *A. ferentina*, and *A. amphinome*, and more especially the two former, are particularly common in the forests around the city of the Isthmus, and it is not possible to walk a mile through them without meeting with many examples. The sound made by the first-named species is like that of the next, and somewhat recalls the noise produced by a boy's imitation of the old watchman's rattle. It is a decided "click," "click," very often repeated, and can be, as Mr. Darwin says, distinctly heard at the distance of 20 yards. Indeed, I should be disposed to extend this to at least 40 or 50 yards on a clear day, and when no wind could carry the sound away. The noise of *A. amphinome* is a heavier and more grating sound, and the two species can be readily distinguished without being seen. The trees on which they are accustomed to sit are species of *Cassia* or *Mimosa*, and their gray color, closely resembling that of the bark, renders them rather difficult to be seen when at rest.

I once went into the forest some time after sundown to see if they remained at night upon the trunks of the trees, as moths do in the daytime, but I could not find a single specimen, although many trees on which I had noticed them during the day were carefully examined. In a foot-note to page 33 of Mr. Darwin's narrative, he quotes Mr. Edw. Doubleday as having described before the Entomological Society, March

3, 1845, "a peculiar structure in the wings of this butterfly which seems to be the means of its making its noise." He says:

It is remarkable for having a sort of drum at the base of the forewings, between the costal nervure and the subcostal. These two nervures, moreover, have a peculiar screw-like diaphragm or vessel in the interior.

Darwin also alludes to a statement in Langsdorff's travels (1803–'07) that "a butterfly called *Februa hoffmanseggi* makes a noise when flying away like a rattle." This name probably refers to *Ager. ferentina*, which was called *Ager. februa* by Hübner.

In addition to this genus, I have observed the power of stridulation in two other butterflies, viz, in those of the genus *Prepona*, also natives of Tropical America, and in *Charaxes sempronius* of Australia. The noise of *Prepona* is only made as it takes wing from the trunks of the trees, on which it is also fond of resting, and is not repeated during its flight) It is therefore most probably in this case used as a defense against birds or other enemies. The *Charaxes* as it alights upon a bunch of the beautiful and sweet-scented flowers of *Bursaria spinosa* closes its wings with a grating sound not unlike that of the *Prepona*, and repeats the same as it is disturbed from its resting place. In butterflies it would appear that the noises are all caused, as Mr. Swinton suggests, by the rubbing of one vein of the upper wing against a corresponding vein in the lower wing, and probably they are all produced by slight modifications of the same structure, and it would appear that the power of stridulation is confined to the *Nymphalid* group, in which, as will be readily seen, a large development of the veins of the wing, particularly towards their bases, occurs.

There is very considerable difference in the sounds produced by the moths, that of one species having been likened by the older authors to "the voice of anguish, the moaning of a child, the signal of grief." This description applies to the well-known European *Sphinx* (*Acherontia*) *atropos*, familiarly known as the "Death's Head Moth," which gives out a very singular and plaintive cry, not unlike that (though in a greater degree) produced by a captive beetle of the *Geotrupid* or *Coprid* group when pressed between the finger and thumb. The noise of the great *atropos* has caused it to be regarded with superstitious terror, and this added to the grotesquely horrid mark of the skull and eye-sockets upon the thorax has made it in the districts in which it abounds an object of awe and terror. It is somewhat strange that, in this age of entomological research, the means by which the sound is produced by this species is yet unknown, comparative anatomists being considerably at variance in their opinions on the subject. Some observers have stated that the larva of this insect has also the power of emitting a sort of squeaking noise.

In our own country, if any one has ever noticed a large swarm of the pretty little moth, so injurious to our grape-vines (*Alypia octomaculata*), about a bush of flowers, he will have been conscious, if his ears were

attuned to the finer harmonies of nature, of a slight breezy sensation rather than a sound, but one quite appreciable by a clear hearing. If the moths are driven away, the sound ceases, and there is no doubt but that it had been produced by the males in paying court to their mates, and probably by rubbing the antennæ at their tips across the costal nervure, which will be seen to be considerably thickened about its middle, just where the apex of the antenna would reach it. This thickening of the costa is much more apparent in an allied species, *Alyp. lorquinii*, than in our common form. With the latter I was enabled some few years ago, while walking across the Public Garden in Boston, to notice the peculiarity I have spoken of. The insect was in the greatest possible abundance upon a small bush of a plant of the Composite family, the name of which I do not know, not less, I should think, than from two hundred and fifty to three hundred specimens being about the single shrub. I distinctly heard the slight humming noise to which I have alluded, and am quite confident that it did not proceed from the vibration of the wings.

A more remarkable instance of stridulation, and certainly the most striking that has come under my notice, I was fortunate enough to witness during my residence in Australia. I was collecting insects in the Plenty Ranges, about 20 miles from Melbourne, and in the burning heat of mid-day had sat down to rest and pin my captures under the shade of a thick acacia tree. I was astonished and almost startled at a peculiar sound apparently very near me, which was unlike anything I had ever heard, and which I at first thought was the voice of some unfamiliar bird. I listened intently, looking in the direction of the noise, but could see nothing. I took up my net and walked up the opening in the woods, the sound still continuing, and greatly exciting my curiosity. It was very loud and distinct and not unlike "whiz, whiz," repeated by the mouth with the teeth closed. I had proceeded about thirty yards when the noise suddenly stopped. I sat down and waited, thinking that I should again hear it and be able to trace it to its source. I was not disappointed, for in a few minutes it again appeared, and this time quite close to me. I looked very carefully and in an opening, buzzing about with a swaying lateral motion, were two or three insects, which at first sight I took to be some species of Hymenoptera. I gave a sweep with my net and made a capture which was soon safe within my collecting bottle. My heart beat violently, as I found that I had taken a lovely black and orange moth, such as I had never before seen. I was alone, and had no one to whom I could communicate my pleasure, but I clearly understood Mr. Wallace's feeling upon his first capture of *Ornithoptera crœsus*, which he so graphically describes in his "Malay Archipelago," and I felt as if I should have gloried in making those primeval woods echo with my shouts.

Three more of the beautiful little creatures soon found their way to my collecting box, and the records of that day's excitement still remain

with me in a treasured corner of my collection. The whole of my specimens are males, and it was not until some years after that I became acquainted with the other sex of this singular moth. It belongs, as does *Alypia*, to the family *Zygænidæ*, as we at present understand that very incongruous group, and the generic name is *Hecatesia*, my species being *H. fenestrata.*. The structure by which the insect is enabled to produce the singular and striking sound is the thickening of the costal membrane about the apical third, behind which, and nearer to the center of the wing, is a rather broad vitreous space extending almost to the median nerve, this space being transversely ribbed, as are the bundles of eggs in some species of *Orthoptera*. The antennæ are thickened at the tips into a sort of prolonged club, pointed at the extreme end, and with the under side of the terminal joints horny and devoid of cilia. These, striking as they would do in flight at the will of the insect against the transverse muscles of the transparent space, cause the whizzing and characteristic sound which so attracted me, and which is doubtless intended as a call of love to the individual of the weaker sex, who sits enthroned in the branches listening with delight to the noisy homage of her many lovers.

Another species of this most curious group is found in the southeastern part of the province of Victoria, and was called by the late Adam White *H. thyridion*. I took several examples of this in the summer of 1856 at Westernport, the females, differing in this respect to the other species, being much more common than the opposite sex. In this the clear space is much smaller than in *H. fenestrata*, the sound produced by it being weaker and more closely resembling the buzzing of a bumblebee. A third species of the genus, *H. exultans*, from Western Australia, is figured by Boisduval in Trans. Linn. Soc., London, 1877, and a fourth is described and figured as a native of Mexico by Mr. H. H. Druce, in the Biol. Centr Amer., but of the habits of this last mentioned nothing as yet is known.

A LETTER ON ICERYA PURCHASI.

The following letter was written June 10, 1889, by Hon. Edwin Willits, Assistant Secretary of Agriculture, to Hon. Ellwood Cooper, President of the California State Board of Horticulture, in response to a letter from Mr. Cooper transmitting certain resolutions of the fruit-growers of California. It is here published as a good summary of the past work of the Division of Entomology relative to this pest, and as a statement of the present condition of affairs:

DEPARTMENT OF AGRICULTURE, *Washington, D. C.*

HON. ELLWOOD COOPER,

President State Board of Horticulture, San Francisco, Cal.

I have the honor to acknowledge the receipt of your letter of May 20, transmitting the petition of the fruit-growers of California in convention assembled, to the effect

that this Department send a qualified agent to Australia to collect and export to this country the parasites of the Fluted Scale (*Icerya purchasi*). Your petition is timely, and I abundantly realize the importance of the action which you suggest. In reply let me recite briefly the steps which have been taken during the past three years by this Department in regard to this great pest of the California fruit-growers, in order to place clearly before you the present condition of affairs.

As a result of numerous petitions from your State, in the spring of 1886 a competent agent of the Division of Entomology was appointed and was located at Los Angeles with instructions to carry out a certain line of experimentation which was mapped out for him by the Entomologist, Professor Riley. Later in the season another agent was sent to the same spot and the results of their combined work were published in the Annual Report of this Department for 1886, in an extended article by Professor Riley, which detailed thoroughly the life history of the pest and contained authoritative recommendations concerning remedies. Some of the washes recommended in this report were proven by careful experimentation to be perfectly efficacious and quite within the means of the most indigent fruit-grower.

Early in the spring of 1887 Professor Riley visited California in person and investigated the sections of the State in which the *Icerya* occurs, and in an address before your State Board at Riverside summarized his conclusions. Among other points brought out in this address was the suggestion that it would be very desirable to introduce its natural enemies and parasites from Australia. He expressed his regret that he would be unable to send one of his agents for the reason that Congress had limited the field of his investigation to the United States, but said that California, or even Los Angeles County, could well afford to appropriate the funds for the sending of an expert to Australia to devote some months to the study of the parasites there and to their artificial introduction into California.

During the summer of 1887 the two agents previously mentioned—Messrs. D. W. Coquillett and Albert Koebele—were continued in their work upon *Icerya*, and the Division at Washington was engaged in an industrious correspondence with entomologists in South Africa, Australia, and New Zealand, with a view of ascertaining facts bearing upon the natural habitat of this species and upon its natural enemies in these countries. The results of the additional experiments by the agents were published in the Annual Report of the Department for 1887. Those reached by Mr. Coquillett concerned chiefly the matter of treating trees with gases, while those attained by Mr. Koebele related entirely to washes. Meantime it had been found by correspondence that at least one important parasite existed in Australia, and strong efforts were made by the Department and also by the California delegation in Congress to secure a specific appropriation for the purpose of studying and importing this parasite. These efforts, as you well know, failed, as did also the equally strong effort on the part of this Department to have the clause in the appropriation bill, restricting the payment of traveling expenses to expenses within the United States, removed from the bill. The Department was thus rendered by Congress apparently powerless in the matter, but, fortunately, by a happy chance, which however will not occur again, we were able to send an agent after all through the courtesy of the Department of State. Congress had appropriated a large sum to enable this Government to exhibit at the Melbourne exposition, and the Secretary of State and the chief of the commission, Mr. McCoppin, of California, were kind enough to set aside a sufficient sum for this purpose, and Mr. Koebele went to Australia in August and accomplished the results with which you are already familiar.

During the winter of 1888-'89 strong efforts were again made by this Department to secure the removal of the restricting clause concerning foreign travel with the idea that, should Mr. Koebele's results warrant further importation of parasites, we would desire to send him or another agent again during 1889; in fact, to take just the action which you have petitioned us to undertake. This effort was apparently successful, and, as the Entomologist understood, the appropriation clause passed Con-

gress in this modified form. On my assumption of my present office, in discussing this matter with the acting entomologist, I was put in possession of these facts, but was surprised to find, upon examination of the appropriation bill, that, in some way which I can not at this time explain, the restricting clause had been again inserted after it had been considered certain that it would be removed. The result is that the Department now finds itself in the same condition in which it was last year, and the only hope of Government help in this matter will rest in securing independent legislation the coming winter. The Department will urge strongly either the passage of an independent resolution or the addition of a clause to the appropriation bill which will set aside enough funds for this purpose, and we hope for your earnest co-operation in this direction.

Your Board should pass further resolutions and place them in the possession of the Senators and members of Congress from your State, urging such legislation, and in this way some action may possibly be brought about.

I have entered into this matter at some length in order to place strongly before you the fact that the Department has in no way been blind to the importance of the subject and that the interests of California have not suffered at its hands, as well as to show you definitely the impossibility of taking such action as you suggest at the present time, and to indicate, moreover, that efforts to obviate this state of affairs have been by no means wanting.

Meantime, however, I may express myself as strongly of the opinion that it will not do for California fruit-growers to tamely await Government aid in the way of the importation of parasites. I have seen myself that the *Icerya* can be overcome by persistent toil, and am quite inclined to indorse the sentiments expressed by Professor Riley upon page 164 of the December number of INSECT LIFE, a copy of which is sent you by accompanying mail. I would also call your attention to Professor Riley's latest article upon this insect, which you will find in the Annual Report for 1888, a copy of which has doubtless already reached your office.

Yours, respectfully,

EDWIN WILLITS,
Assistant Secretary.

EXTRACTS FROM CORRESPONDENCE.

American Insecticides in India.

A copy of your valuable periodical INSECT LIFE, Vol. I, No. 9, has to-day been sent to me. On page 293 you remark as follows:

"It has for some time seemed to us that the scale insects of the coffee plant which do so much damage in Ceylon and other parts of India could be successfully treated with the remedies which we have found in this country so valuable against the scale insects of the orange, namely, the kerosene soap emulsions, and we hope soon to bring this before the attention of the British Government."

You are probably not aware that kerosene emulsion has already been tried on Green Coffee-scale (*Lecanium viride*) in South India, and that so far as the experiments went it was found to be successful. Arrangements are being made for further experiments, and it is confidently hoped that this insecticide, with which Dr. Riley's name is so honorably associated in America, will prove of equal service in India. An account of what has been done in the matter of the introduction of kerosene emulsion and other American insecticides into India will appear in my forthcoming report, which has been in type for some months, and which will probably be published before this reaches you. A copy of the complete report, which deals with the whole investigation of Indian economic entomology, undertaken by the trustees of this museum, will be forwarded to you as soon as it appears.—[E. C. Cotes, Indian Museum, Calcutta, India, May 22, 1889.

Sciapteron robiniæ in Cottonwood in Washington Territory.

By to-day's mail we send you what appears to be the borer that destroys the Cottonwood and Balm trees of the West. While holding the creature on the blade of a saw, the pretty winged bug that you will find in the box shed off the dry skin, which you will also find with it. I took the creature directly from a hole in a Cottonwood tree which had apparently been bored by a borer. Please give us all the information about it that you can, its habits and the way to kill it, for publication in our paper.—[Legh R. Freeman, editor Washington Farmer, North Yakima, Wash. Ty., March 10, 1889.

REPLY.—Your letter of the 10th with specimen just received. The insect which you send is one of the Western Clear-winged Moths and is known as *Sciapteron robiniæ*. It breeds in Locust and White Poplar in Nevada and has been found in Cottonwood in California. It is a near relative to the common Peach-tree Borer of the East and belongs to a group of moths the larvæ of which all bore into the stems of trees and plants. It is probably neither sufficiently abundant nor destructive with you to occasion a demand for a remedy.—[May 18, 1889.]

A Fodder Worm in the South.

Mr. W. H. Peel, of this place, has called my attention to a worm which during the winter for three years has infested the stacks of dry corn blades, here universally called "fodder" and the main representative of hay in this country. The grown worm (I have seen but one) is over an inch long, a uniform brown, without hair, almost translucent, has full complement of feet for crawling rapidly, something like the Tortricidæ, but does not roll the dry leaves nor make a web till the chrysalid condition. Very abundant it seems and destructive—a new pest to the farmers of this region; yet as the fly has been coming out some two weeks I could get only a few, which are sent in a small box to-day. They come to light, but with others, and I refrain from catching them for fear of getting them mixed. According to Mr. Peel the worms are active for months, webbing up about the 1st of March and coming out the last of the same month, three to four weeks.—[Lawrence C. Johnson, Waterford, Miss., May 4, 1889.

REPLY.—Your letter of the 4th instant, inclosing specimens of an insect which attacks the stalks of dry corn, from the place of Mr. W. H. Peel, of Waterford, Miss., has been received. The specimens are very interesting, and belong to a species of Pyralid known as *Helia æmula*. The larva of this species has previously been found feeding upon the dry leaves of various plants in the woods, and also upon a number of fodder plants during the winter. The remedy will depend altogether upon the particular method in which the fodder corn is stored. Will you kindly request Mr. Peel to write us a full account of the way in which this insect works, and the manner in which he stores his fodder during the winter, and we will then advise him as to remedies. If he can send other specimens we shall be glad to get them.—[May 15, 1889.]

SECOND LETTER.—Your favor of the 15th instant received. Much obliged for your prompt information about *Helia æmula*. I found some dry clover hay once in process of destruction by a worm similar to this one, but on that occasion failed to get a fly, and had no one to watch them. I can tell you now all that is known of this specimen in Mississippi. As I wrote before, no one seems ever to have noticed its ravages until three years ago. The fodder in question consists of the blades stripped from standing corn (maize) as the fashion is at the South, and dried in the field in the sun. When dry or nearly so it is taken up and tied by a withe of its own leaves into bundles of about two pounds' weight. These when considered cured are carted up to points selected and stacked, with the butts within next the stack-pole, the ends without. A little of the ends take the weather as in any fodder that is stacked, and becomes worthless. This item is mentioned because it is the only part of the bundle

not attacked by the insect. Externally, therefore, the stack seems perfectly sound and safe, when within it may be a mass of fragments and dung. The manner of eating the blades you may see in the bits put in the box sent you. They eat it pretty much all except the central vein; especially at the binds, where most compact, they eat all, running from that towards the ends. But a moldy or spoiled spot they never touch. The stack of fodder I saw had been put up about the last of August, 1888, and as remarked appeared perfectly sound till opened about the 1st of April. I am told the larvæ were then numerous, but they had already begun to web up. This is about all I can tell you; I never saw the egg.—[Lawrence C. Johnson, Bolivar, Tenn., May 19, 1889.

REPLY.—Your letter of the 19th, from Bolivar, Tenn., has just come. Thank you very much for the additional information relative to the habits of *Helia æmula*. I should imagine from what you write that the value of the fodder stacks is so slight that altogether the most satisfactory remedy will be to burn those which are infested with this insect. It strikes me that in this way and at slight expense the numbers of this pest can be greatly reduced.

The worm which you found in dry clover was probably a different thing, and I have no doubt that it was the common Clover-hay Worm (*Asopia costalis*), which you will find figured and described on pages 102 to 107 of Professor Riley's Sixth Report on the Insects of Missouri.—[May 23, 1889.]

Colonel Pearson's Method of fighting Rose Beetles.

I kill Rose-bugs by *smashing* them. I know of no insecticide which is also an insecticide for the Rose-bug—that is, which will kill the bugs and yet not injure the plant. Pyrethrum will intoxicate or stupefy them. They will fall from their perch and after a time recover and fly again. I have been experimenting for the past two weeks with all the poisons procurable in the drug shops, and without desired results. In dealing with Rose-bugs in my vineyards I send my men along the trellis early, from 6 to 10 a. m. They strike the vines with paddles; the bugs fall on the ground, and then they *smash* them with the paddles. The vines are trained upon a single wire, and the ground is made smooth and clean beneath, so that when the bugs fall they are at our mercy. This job must be done every morning until the bugs leave the vines for other foods. They are now on my strawberries and roses by myriads. Even if we could find something medicinal to kill the bugs, it would be of no use during such an invasion as we have had for the past three years in Vineland. Kill one and four more come to attend the corpse. They migrate and travel onward like the Army-worm. They must be fought by killing them as fast as they come. I have by this constant work for two or three weeks saved most of my vines, and I am now searching for something which will be offensive to them and drive them away from the plants they infest. Carbolated lime is the best I have found thus far.—[Alex. W. Pearson, Vineland, N. J., June 15, 1889.

Lyctus sp. in Bamboo.

I send you by mail to-day three bugs that are eating up a bamboo work-basket from Japan that I bought in Chinatown, San Francisco, Cal., a year ago last April. I have given it a thorough heating with flat-irons, which did not kill the pests, and then I gave the basket as thorough a bath of benzine, and that has not destroyed them. * * * The basket is being perforated with round holes, under which I find little dust piles. The dust I send with the bugs.—[Mrs. N. W. C. Holt, Winchester, Mass., June 20, 1889.

REPLY.—I beg to acknowledge the receipt of your letter of June 20. The insect found in your bamboo work-basket is not unknown as an enemy to bamboo imported from China and Japan. It is a species of a genus of wood-boring beetles called by entomologists Lyctus. You need not fear the spread of this insect, as they feed on

nothing but bamboo. Keep up your benzine treatment and you will kill the insects. * * *—[June 25, 1889.]

The Texas Cattle-tick.

Will you please give me the history of the Texas Cattle-tick (*Ixodes bovis*) or refer me to the literature on the subject? They are a terrible pest here.—[M. Francis, D. V. M., College Station, Texas, June 17, 1889.

REPLY.—I beg to acknowledge the receipt of your letter of the 17th instant, requesting information concerning the Texas Cattle-tick (*Ixodes bovis*). This species was described by Professor Riley in a special report of this Department (Report of Commissioner of Agriculture on Diseases of Cattle in the United States, 1871, p. 118, foot-note). It is a reddish, coriaceous, flattened species, body oblong oval, contracted just behind the middle, and the whole insect is from one-quarter to one-half an inch in length. It occurs from the Northern States to Nicaragua, and lives not only on cattle but even on the rattlesnake, the iguana, and on small mammals. It no doubt attaches itself to almost any animal that brushes against it in going through the grass. The species is mentioned in a treatise on the external parasites of domestic animals, by A. E. Verrill, in the report of the Connecticut Board of Agriculture for 1870, page 46. It is found in our Northern States, but is, however, most abundant in the Southwest, Missouri to Texas, and has been taken in large numbers by Mr. J. McNeil on horned cattle on the west coast of Nicaragua.

As to remedies, the kerosene emulsion has been recommended for lice on cattle in Bulletin 5 of the Iowa Agricultural Experimental Station, May, 1889, page 185. This would no doubt be the best and most practical remedy for the Cattle-tick also, and is indorsed by Dr. Cooper Curtice, of the Bureau of Animal Industry of this Department, who recommends that the emulsion be made with soap according to the formula originally proposed by this Division. The emulsion should be applied in an 8 per cent. solution with a force pump, using the Riley or Cyclone nozzle and a few feet of hose. It thus easily penetrates the hair of the animal, and at that strength can not injure stock.—[June 24, 1889.]

The Boll Worm in Texas.

I take the liberty to report to you the condition of affairs in regard to the Boll Worm (*Heliothis armigera*) and its yearly destruction of cotton, with the view of asking your opinion and advice for my own and the public benefit. I live in one of the northern counties, where cotton is the principal crop. We raise what is known as the Moon cotton, one inch and a quarter staple. This county loses yearly from the ravages of Boll Worms and moth from $300,000 to $400,000 on cotton alone, the moth, in my opinion, doing nine-tenths of the damage. The first crop of the caterpillars appeared in the corn near the 20th of May. On examination the 1st of June four-fifths had left the corn to transform to pupæ, but I found caterpillars up to the 10th of June, though scarce. In order to destroy them the planters generally put lamps in the field in the month of May, and expect to continue their use until October. The lamps are similar to those described in the Agricultural Report for 1880. page 239. The field crop of corn is now in silk and tassel.

Usually from the 1st to the 10th of August the Boll Worm moth leaves the corn and adopts the cotton as its home. This brood does immense damage, the moth laying her eggs in the squares in the blooms and in young bolls from the size of a garden pea to a partridge egg in preference to any other place. She pierces them as if done by a needle or pin, and in a few days they drop from the plant. Some farmers, not knowing what insect does this, have given them the name of sharpshooters, and it is yet a mooted question with us. By the time the cotton puts on a new crop of squares and blooms the moth is ready for it again, and if the weather is moist and warm it thus keeps on until frost; but should a drought prevail, with hot, drying

winds, the eggs will not hatch, and this puts an end to them for that year, with the exception of a few scattering ones. Thus a dry and hot July and August is always a heavy crop year on the heavy, black, waxy prairie lands. Now I wish to know whether we have adopted the best course for the destruction of the Boll Worm. Is there any other course that has been successful in destroying them? Any advice or suggestions that you may choose to give us will be thankfully received. * * * —[William Somerville, Bagwell, Red River County, Tex., June 17, 1889.

REPLY.—I beg to acknowledge the receipt of yours of June 17 in reference to the damage done by the Boll Worm in your State. I can best answer your question by sending you a copy of the Fourth Report of the U. S. Entomological Commission, published in 1885, and which you do not seem to have seen. You will find the Boll Worm treated on pages 355 to 384. The destruction of the moths by trapping is not a satisfactory remedy, for experiments have proven with other species that the great majority of the insects so captured are either males, or females which have already laid their eggs. The first business of the female moth after issuing seems to be to lay her eggs, so that very few of them are caught in this way. The result is that other remedies are of much greater avail. The suggestion regarding the worming of corn while the first brood of worms is at work is a most excellent one, and the use of the arsenical poisons as indicated upon page 381 also affords a good remedy. The suggestion upon page 380, that in localities where no corn is grown over a considerable space it will pay to grow small patches here and there as traps for the early worms, is also a good one. It will be unnecessary to elaborate further, as the information is all contained in condensed form in this report.—[June 22, 1889.]

A cosmopolitan Flour Pest.

We send you herewith specimens of insects which are breeding in our flour mill. They seem to breed under basement floors and come up and fly away on warm days. There seems to be a difference of opinion as to what they are, and as there are no entomologists in this section we would be pleased to have your opinion and whether or not they will be likely to become a pest. They do not seem to work in wheat bins, but rather in flour dust in dark places. They breed all winter and spring and are now very numerous. We have tried several remedies, but Persian insect powder is the only thing that killed them.—[McPherson & Stevens, Sprague, Wash. Ty., May 18, 1889.

REPLY.—Your letter of May 18 with accompanying specimens has been received. The beetle which occurs in your flour mill is *Philetus bifasciatus*, a cosmopolitan species which feeds everywhere in flour and farinaceous products. Inasmuch as you find that Persian insect powder kills them readily we would advise you to use it very thoroughly and to hold them in complete subjection, for otherwise they will doubtless become quite a pest with you.—[May 27, 1889.]

Mites on a Neck-tie.

I send you in a tin box a neck-tie covered with Acari which a gentleman sends me from San Francisco. He says the tie has lain in a drawer and has been worn at intervals. He first noticed the "foreign substance" two weeks ago and thought it sand until he detected motion in the particles. What mite is it? How can garments be best treated to get rid of it?—[E. J. Wickson, Berkeley, Cal., May 25, 1889.

REPLY.—Yours of the 25th ultimo and mites duly received. We can not distinguish between the specimens found on the neck-tie and the common Cheese Mite (*Tyroglyphus siro*), and there must have been something very peculiar about those neck-ties or else the gentleman who sent the specimens must have been a bachelor and have kept his crackers and cheese in the same drawer with his clothes. The same mite, as you know, is found in flour of all kinds and milk. Sulphur is the best remedy. Either fumigate with burning sulphur or sprinkle with flowers of sulphur mixed in water.—[June 1, 1889.]

The Potato Beetle in the South.

The Potato Beetles herewith should have been sent you some weeks ago. They are from Madison Station, Madison County, Miss., the beetles occurring in several potato fields at and within a mile of the station. This is the first year I have seen them in Mississippi. If they have been here at an earlier date you may, perhaps, know it. I send them as a note of the spread of the beetle so far south.—[Dr. D. L. Phares, Agricultural College, Mississippi, May 11, 1889.

REPLY.—I beg to acknowledge the receipt of yours of the 11th instant, with accompanying specimens of the Colorado Potato Beetle (*Doryphora 10-lineata*). I believe that this is the first time they have been noticed so far south in your longitude. I will make a note of this matter for INSECT LIFE.—[May 18, 1889.]

Swarming of Urania boisduvalii in South America.

I take the liberty of mailing to you two specimens of butterfly captured at Colon, Republic of Colombia, March 18 and 25, 1889. When within a few hours of that port these insects were seen flying from the mainland in a northerly direction across the bay. This migration continued daily from the date of arrival, March 18, for nearly a week. When the flight began I could not ascertain. Its duration daily was from just before sunrise until sunset; it was protracted, however, until late at night on three evenings near and at full of the moon. The point which attracted my attention was the vast number of the insects. The air was actually full of them. It resembled an unremitting shower of forest leaves in autumn. I could learn nothing of its family history from the residents, but it is doubtless familiar to you. The excavations in each specimen were beautifully done by the Red Ant (*Formica rufa?*) in spite of the suspension of the tray in which the butterflies were placed from the ceiling by one string, and the saturation of said string with turpentine and castor oil.—[Dr. S. A. Davis, 107 West 47th street, New York City, May 9, 1889.

REPLY.—Your letter of May 9 transmitting specimens of a "butterfly" captured at Colon, United States of Colombia, has been received. The insect sent is not a butterfly but a moth, and is known as *Urania boisduvalii.* It bears, however, a striking resemblance to some of the large swallow-tailed butterflies of the genus Papilio. Your note concerning the abundance of this insect is very interesting.—[May 20, 1889.]

Letter on the proposed "American Entomologists' Union."

* * * I see in the March (1889) number of INSECT LIFE you ask for ideas concerning the proposed Society of Economic Entomologists. I do not think my views on the subject are worth much, but such as they are, they are as follows: I should like to see an organization founded, with members in every State in the Union (and I do not see why not also in Canada and Mexico), with the headquarters at the Department of Agriculture at Washington. Such a society to be called, perhaps, the "American Entomologists' Union," and to appoint a secretary in every State at least, and in the case of big States, like Texas and California, two or more; these to collect all the information they can relative to insects, especially from an economic point of view, and forward each one a report, at stated intervals, to Washington. These reports to be preserved and examined by a committee appointed, and the essence of them printed in INSECT LIFE or as a special bulletin. This I think would (1) bring economic entomologists in touch with one another; (2) enable them to benefit from one another's discoveries; (3) and especially the facts thus collected might be seen often to have a significance which would be totally lost were they to remain isolated among their discoverers; (4) although apparently adding to the work of the Department of Agriculture it would really diminish it, as you would have only the secretaries' reports to deal with, and it would be their duty to receive and collate reports of others within the boundaries of their own States.—[Theo. D. A. Cockerell, West Cliff, Custer County, Colo., May 12, 1889.

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX,* WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By LORD WALSINGHAM.

[*Continued from page* 291 *of Vol. I.*]

LITHOCOLLETIS Z.

In revising the index to the genus *Lithocolletis*, one group of six supposed species has given me more trouble than the others. These are: *ulmella* Chamb., *modesta* F. & B., *conglomeratella* Z., *bicolorella* Chamb., *quercivorella* Chamb., and *obtusilobæ* F. & B.

The first two are described as mining the upper side of elm leaves. The food-plant of the third is not known; and the three last are upper-side miners on the leaves of species of oak.

Zeller, in describing his *conglomeratella*, mentions two varieties of that species, differing chiefly in the extension of the white line along the dorsal margin of the fore-wings, and Chambers uses this character to distinguish his *bicolorella* from *ulmella*, with which he had at first placed it. He further says that *bicolorella* has *two* costal streaks, while *ulmella* has *three;* but in describing *quercivorella*, also with *three* costal streaks, he says the third streak is a mere spot before the cilia. In short, it is doubtful whether there are sufficient differences between the six descriptions to justify the separation of any one of these species from the others on the ground of color or markings. The evidence I have to rely upon in forming a conjecture (for it can scarcely be more than a conjecture) as to their distinctness is as follows:

(1) An authenticated specimen of *modesta* F. & B. from Boll's collection.

(2) A specimen received from Miss Murtfeldt, regarded by her as *ulmella* Chamb.

(*a*) A figure of a specimen in the collection of the American Entomological Society at Philadelphia, probably received from Chambers.

(*b*) A figure of a second specimen in the collection of the Peabody Academy of Sciences at Salem, Mass., received from Chambers under the above name, and presumably equal to his type.

(3) A specimen of *conglomeratella* referred to by Zeller in his description of that species as the second of the varieties from which his description was taken.

(4) Two specimens, unnamed, received from Miss Murtfeldt, bred from mines on the upper side of the leaves of white oak.

(5) An authenticated specimen of *obtusilobæ* F. & B. from Boll's collection.

It is most improbable that the elm and oak feeders should be the same, although Miss Murtfeldt's specimen of the supposed *ulmella* is scarcely distinguishable from those bred from oak, and Boll's specimen of *modesta* actually bred from elm is still less so. We may at once admit that there are at least two distinct but very closely allied species, one on elm, the other on oak, but I think there can be no doubt whatever that *ulmella* and *modesta* are the same. The name *ulmella* takes precedence for the elm-feeder. I fear that some years ago in naming specimens for some of my American correspondents I may have been guilty of some confusion as to this species, having been misled by seeing specimens of *bicolorella* distributed by Chambers under the above name. We now come to the far more difficult identification of the oak-feeding species.

Zeller's specimen of *conglomeratella* is labelled "Dallas, Tex., Boll." This differs from the other specimens here referred to only in its somewhat duller color, but it is not in good condition, although the markings are easily visible. It agrees pre-

* Index to the described Tineina of the United States and Canada. V. T. Chambers. Bull. U. S. Geol. and Geog. Surv., IV (1), 1878.

cisely with the figure of the specimen in the collection of the American Entomological Society, but Chambers admits having mixed his specimens of *bicolorella* with *ulmella*, and this figure probably represents the oak-feeder. Zeller's descriptions of the three forms, which he regarded (probably with good reason) as varieties of one species, are extremely clear and precise. The first is an admirable description of my specimen of *obtusilobæ* F. & B., and the third is an equally good one of the specimens received from Miss Murtfeldt. I have no doubt whatever that these are varieties of one species feeding on various oaks. There are no sufficient differences to distinguish *conglomeratella* Z. from these, or from *bicolorella* Chamb., which would certainly be included under Zeller's descriptions. I think it will be safe to regard three of the four names as applying to one and the same variable insect, for which the name *conglomeratella* takes precedence. The specimens mentioned as received from Miss Murtfeldt were bred from the upper side of leaves of *white* oak, but this would certainly not distinguish them from *quercivorella* or *bicolorella*, both upper-side mines, the one bred from *Q. bicolor*, the other from *Q. obtusiloba*. The main differences upon which Chambers seems to rely in separating these two species are as follows:

Bicolorella.	*Quercivorella.*
Fore wings yellowish saffron, dorsal stripe extending to cilia. Oblique dorsal streak absent. Two costal streaks, followed by small dots. Hind tarsi white.	Fore wings reddish orange, dorsal stripe extending beyond middle of dorsal margin. Oblique dorsal streak present; three costal streaks, the third a mere spot. Hind tarsi annulate with black.

In all other respects the two descriptions are approximately the same. The darker ground-color and spotted hind tarsi of *quercivorella* may perhaps be relied upon to distinguish this species from its allies. The synonymy of these species should therefore stand thus:

(1) *Ulmella* Chamb. = *modesta* F. & B.

(2) *Conglomeratella* Z. = *bicolorella* Chamb. = *obtusilobæ* F. & B.

(3) *Quercivorella* Chamb.

NOTE.—Chambers, in distributing specimens to his various correspondents, frequently appears to have attached a wrong name to them. This he admits in more than one instance in his writings. The utmost caution is required before accepting a specimen in any collection as a co-type of any one of his species. Dr. Hagen's notes of Frey's examination of specimens in the Cambridge Museum (Papilio, IV, 151–3) show that in some cases the professor failed to recognize specimens that he must certainly have seen before. This may be partially accounted for by the condition of the specimens, but where Clemens' species are referred to it must be remembered that these were determined by Chambers, who had not seen Clemens' types at Philadelphia and who may have wrongly identified them in some cases.

Lithocolletis tubiferella Clem.

It may be worth while to mention that when I saw Dr. Clemens' type of this species in the collection of the American Entomological Society, Philadelphia, in 1871, I made a note, "Hind wings gone; very unlike a *Lithocolletis*." It is perhaps doubtful whether Chambers was rightly acquainted with the species. The larva supposed by him to belong to it (Can. Ent., III, 165–6) was proved to be Coleopterous (Can. Ent., IV, 123–4), and he does not mention the true larva, so far as I am aware, in any of his writings. He compares the perfect insect with his *bifasciella* (unknown to me), and says of the former that the tuft is white, and it has no costal and no dorsal streaks behind the fascia, and the apex is not dusted. Chambers described his *bifasciella* from a single bred female, and if the subapical markings were not conspicuous it is possible that Clemens may have omitted to mention them. In Dr. Hagen's paper (Papilio, IV, 152) mention is made of specimens (one good) of *tubiferella* Chamb. from Kentucky in

the Cambridge Museum, and a comparison of these with the remains of Clemens' type at Philadelphia would decide the point; but for the present I should not be justified in attempting to correct their synonymy, and scarcely in suggesting that either of them may be identical with *lebertella* F. & B., which must be at least a nearly allied species.

Lithocolletis basistrigella Clem. = intermedia F. & B.

I have authenticated specimens of *basistrigella* Clem., compared with the type in the collection of the American Entomological Society of Philadelphia, and also of *intermedia* F. & B., from the Zeller collection, received from Frey, and I am able to say positively that these two species are the same. I have met with it also in Mendocino and Siskiyou Counties, Cal., Rouge River, in Oregon, and have received it from Miss Murtfeldt from Missouri.

Lithocolletis rileyella Chamb. = tenuistrigata F. & B.

I received from Miss Murtfeldt, in December, 1878, a *Lithocolletis* labeled "Tentiform mine on under side leaf of red oak." This specimen agrees precisely with Chambers' description of *L. rileyella*, and is obviously that species. It is undistinguishable from *tenuistrigata* F. & B., of which I have specimens and mines.

Lithocolletis quercibella Chamb. = subaureola F. & B.

I was at first disposed to think that *quercibella* could only be regarded as a synonym of *argentifimbriella*. Chambers writes that it resembles closely his *fuscocostella*, which I have shown to belong to that species: but after a careful study of his description by the side of a specimen of *subaureola* F. & B. I find that this is applicable in all particulars to that species, although the first, *quercibella*, is described as glistening snowy-white, with the apical third pale golden, and the other as pale golden-brown, with white markings. Chambers describes the subcostal streaks as pale golden. Frey and Boll regard this as corresponding with the ground color of the wing, and mention the straight, rather broad basal streak as being white, whereas Chambers regards white as the real ground color. With a specimen before one it is easy to see that the two descriptions are both accurate and precise in every detail.

Lithocolletis clemensella Chamb.

Another species that must be nearly allied to these is *clemensella*. I am induced to regard this species as distinct, owing to its feeding on *Acer saccharinum*, and by Chambers' remark that "the hinder marginal line at the base of the dorsal cilia reaches to, but does not pass around, the apical spot." I find this peculiarity well marked in a figure of the species taken from a specimen in Professor Fernald's collection, and I know of no allied species in which the same thing occurs. This insect is omitted from the Index, although it is given in the List of Food-plants of Tineina (Bull. U. S. G. G. Surv., IV, 109, 1878).

Lithocolletis argentifimbriella Clem.

= *Argyromiges quercialbella* Fitch.
= *Lithocolletis longestriata* F. & B.
= *Lithocolletis fuscocostella* Chamb.

In the Canadian Entomologist (Vol. III, 57) Chambers suggests that *argentifimbriella* Clem. may be the same species as *quercialbella* Fitch, but he appears to have never fully satisfied himself that this was the case owing to the differences between the descriptions of the larvæ. On page 182 of the same volume he points out that

whereas Fitch describes the larva of *quercialbella* as being "flat," no known flat larva of this genus makes a tentiform mine, or an oval cocoon, such as Fitch describes. The larva of Clemens' species is cylindrical, and as Fitch's description is *not comparative* it is presumable that the word "flat" was not used in the sense in which Clemens and Chambers use it for larvæ of this genus, as distinguishing them from the cylindrical form.

Frey and Boll (Stett. Ent. Zeit., XXXIV, 209) themselves suggest the possibility that their *longestriata* may be the same as *argentifimbriella* Clem., and their description is so clear that, taking into consideration the similar larval habits, I think there can be no doubt that this is so.

In the Cincinnati Quarterly Journal of Science (II, 229), Chambers professes an acquaintance with *argentifimbriella* Clem. and confirms its identity with *longestriata* F. & B. (although he subsequently treats them as separate species in his index), but he fails to recognize his own *fuscocostella*, described shortly before that date, as falling under the same description. Chambers does not mention ever having taken or bred *argentifimbriella*, but there is a single specimen from Kentucky in his collection, now in the Museum of Comparative Zoology, Cambridge, Mass., about which Dr. Hagen writes (Papilio, IV, 151): "*Argentifimbriella* Chb., I, Ky. (very bad condition; perhaps, ? *longestriata* Frey)." It was probably owing to the condition of his specimen that Chambers failed to see that his description of *fuscocostella* corresponded with it. I have a specimen of the latter species from Dr. Riley, from Washington, D. C., and a specimen of *argentifimbriella* compared with Clemens' type in the collection of the American Entomological Society at Philadelphia. They are evidently the same.

It is somewhat doubtful whether this insect was first publicly named by Clemens or Fitch. Fitch's d scription was publish d in the annual report of the New York State Agricultural Society, issued as Vol. XVIII of the Transactions of that society, professedly for the year 1858. The title-page is dated "Albany, 18 9." The letter of presentation from Mr. B. P. Johnson to the Hon. D. W. C. Littlejohn, headed "In assembly, April 7, 1859," evidently antedates the real publication, for on page 585 is a letter from his excellency Joseph A. Wright, American minister at Berlin, dated "Berlin, May 11, 1859." In my copy is pasted the following letter:

"State of New York, Agricultural Rooms,

"*Albany, May* 19, 1860.

"Sir: Will your lordship be pleased to accept for your library the eighteenth volume of the Transactions of the New York State Agricultural Society for the year.

"I am, most respectfully, your very obedient servant,

"B. P. Johnson,

"*Corresponding Secretary.*

"Lord Walsingham,

"*President Royal Agricultural Society of England.*"

The wording of this letter seems to show that this volume of the Transactions was not actually distributed until the year 1860, especially as the first three figures of the date "1850" are *printed* (not written) on the paper. Now, the date of Clemens' paper in the Proceedings of the Academy of Natural Science, Philadelphia, is November, 1859, and if Vol. XI, in which it ap peared, was issued before the agricultural volume, Clemens' name must take precedence.

Leaving my American friends who have access to the required information to correct me if I am wrong, I propose in the revised Index to give precedence to *argentifimbriella* Clem. over *quercialbella* Fitch.

GENERAL NOTES.

TWO LOCAL OUTBREAKS OF LOCUSTS.

Two locust occurrences worthy of note have come to our notice this season, one in Utah and another in Louisiana.

Under date of April 29, Mr. James B. Darton, of Nephi City, Utah, wrote the Secretary of Agriculture that millions of grasshoppers were at that time hatching out on the borders of the grain fields in the vicinity of Nephi City. At our request and to save time Mr. Bruner, our agent at Lincoln, Nebr., took up the correspondence and wrote us May 17 that he had received from Mr. Darton eight or ten specimens of the locust. These, however, from having been treated like botanical specimens, and evidently put through a press, could not be specifically determined. They were the young of Melanoplus, but might belong to any one of five species. A second lot, which was requested to be forwarded alive in a tin box, was reported on June 5 by Mr. Bruner, but still left us much in the dark as to the exact species doing the injury. The first lot seemed to be composed of at least three species, *M. bivittatus*, *M. spretus*, and *M. femur-rubrum* or *M. devastator*; but the other sending, consisting of a quarter pint of decaying pupæ, were nearly all *Camnula pellucida*, and just what other species were with them can not be said. In this outbreak several species were evidently united in the work of devastation. For several years back various causes have been working together to produce the injurious numbers appearing this year, but no great damage is to be looked for at the present in this region.

In Louisiana the species which occurred was *Melanoplus cinereus*, regarding which the Hon. T. J. Bird, Commissioner of the State Bureau of Agriculture, at Baton Rouge, wrote us June 8, mailing specimens. The damage done was slight and consisted in the leaves of young cotton plants being eaten. This is a local non-migratory species, all of which, though liable to multiply to such an extent as to cause some little alarm, seldom really do any appreciable damage. Probably the best method of treatment is by the use of the bran-arsenic mash, concerning which several paragraphs will be found in the Annual Report of the Department for 1885, pages 300 and 301.

TENT CATERPILLAR IN ARKANSAS.

Mr. J. W. Bland, of War Eagle Mills, Benton County, Ark., has sent us a specimen of the moth of the American Tent-caterpillar (*Clisiocampa americana*) with its eggs, which he found the moth in the act of depositing on a peach limb on the 8th of June. We place this on record as giving an idea of the time of egg-laying of this species in that part of the country. These eggs were for the second brood, which it is not

unlikely may be followed by a third in Arkansas. Our correspondent writes us that this insect is very destructive to fruit trees in his county.

THE THISTLE CATERPILLAR IN WASHINGTON TERRITORY.

Mr. E. O. Schwägerl, of Naomi, Kitsap County, Wash. Ty., sent to us the middle of June specimens of the larvæ of the common Thistle Butterfly (*Pyrameis cardui*) infesting thistles and nettles there and which he has not been able to find on any other plants. This is a common butterfly, which is known to feed on the thistle the world over, and helps much in keeping this noxious plant in check in thistle infested localities. Our correspondent writes us that 90 per cent. of the thistles around Seattle are infested. The larvæ attack first the head or young shoots, eating out the flower buds, and then work down inside the stems, thus effectually destroying the seed crop. Birds do not eat these larvæ on account of their short, sharp spines.

THE CECROPIA SILK-WORM AGAIN.

In INSECT LIFE, for November (page 155), was mentioned the great abundance of the Cecropia near Calaway, Nebr. As we wished to obtain some of these cocoons, Miss Brown was written to and at the same time cautioned not to take any old cocoons, as the abundance which she referred to might be due to the accumulations of many years. In her reply she says:

> A little boy collected me about half a bushel, but when I assorted them I found that about half of them were poor. A good many were stung and filled up with small grubs of some other insect, and others were last year's cocoons. I suppose you know that there is not much timber here, excepting where it has been set out and planted, and it is only on the cultivated box-elders, and then only in certain localities, that the cecropia silk-worm is found in numerous quantities.

Under date of December 16, 1888, M. Natalis Rondot writes us:

> You notice, in No. 5 of INSECT LIFE, the remarkable abundance of Cecropia in one of the counties of the State of Nebraska, Miss Clara E. Brown having asked if the cocoons had any commercial value. To this question you replied that on the account of the difficulty in reeling the filament of the cocoon it could hardly be used industrially. This is true; but we may well ask if these cocoons may not be used for spinning into *schappe* (spun silk) or for articles of fantaisie. I do not know whether these cocoons have been studied from this point of view; in France at least no serious trial has been made of them, though I have had some samples of them combed as a matter of pure curiosity. The first question to study is that of the quantity of these cocoons. Miss Brown has, perhaps, personal reasons for complaining of the damage done by these wild worms; but it is possible that in reality the product in cocoons would be very light. It would be important to know how many of these cocoons could be obtained; for, in order to make a proper test, it would be necessary to have several pounds. This Cecropia is little known to us, and I find in fact that we even have no specimens of it. It would be interesting to have some, at least some of the cocoons, such as are found attached to trees, and some of the moths. In examining my notes I find that I saw, some years ago, cocoons and moths of certain species, one of which was very probably the *Platysamia cecropia*, while the others were of one or two species very similar to it. Were they hybrids of the Cecropia? I do not know. As the Cecropia is abundant in the United States you ought to know whether it is of a unique species or whether there are others allied to it.

Early in January we were able to send M. Rondot a few live cocoons of the Cecropia, and in transmitting them gave the following reply to his questions:

The species which is the most common in the United States is the *Attacus cecropia* of Linné. There are two species in this country very closely allied to it and by some held to be simple varieties of the Cecropia; they are the *Columbia* and the *Gloveri*. It is possible that it is to one or both of these that you refer as being mentioned in your notes.

It is hoped, from the live specimens sent M. Rondot, and a similar quantity sent to M. Quajat, at Padua, that these scientists may raise a sufficient crop of Cecropia cocoons to satisfy themselves of their value for the production of schappe. In this connection it may be added that Mr. L. G. Wilson, of Parsons, Dak. (statistical correspondent of the Department), informs us, under date of December 18, that wild cocoons are found, in large quantities in his neighborhood, and that he wishes to send specimens of them to the Paris Exhibition. He has been requested to forward specimens to this Department.—[Philip Walker.]

SPRAYING FOR THE ELM LEAF-BEETLE.

Prof. John B. Smith, in *Garden and Forest* for June 19, gives an account of his experiments in spraying large elm trees on the Rutgers College campus. He used a Seneca Falls force-pump, mounted on a tank holding 40 gallons and provided with a 50-foot hose. The end of the hose is attached to a 10-foot pole, and by means of a light ladder 20 feet in length the foliage of the largest trees, some of which are over 50 feet in height, can be reached. Professor Smith finds that the addition of a small quantity of kerosene emulsion to the mixture of London purple and water is of use in enabling the spray to penetrate the pubescence on the under side of the leaves and to spread wherever it touches instead of collecting in drops and falling. He recommends the addition of a pint of kerosene emulsion to 20 gallons water containing one-fifth of a pound of London purple, and states that this amount of the mixture is sufficient for one of the largest trees.

THE DINGY CUT-WORM (AGROTIS SUBGOTHICA Haw.).

Late in May, 1886, Mr. Henry Nobes, a fruit-grower in the vicinity of La Fayette, Ind., called our attention to the fact that some insect, unknown to him, was destroying the ripening fruit in his strawberry field, large berries being wholly or for the most part devoured. A visit to the field soon revealed the depredator to be this cut-worm, which occurred in great numbers under the straw mulch. Worms were not only caught in the act of eating the berries, but many were found gorged with the fruit, the red color distinctly showing through the skin of the culprits. In places where the mulch had been removed they did not appear to trouble the fruit, except to a very limited extent.—F. M. Webster.

THE EUROPEAN WHITE GRUB.

We do not know which to wonder at the most, the industry of the woman or the numbers in which the White Grub (larva of the European *Melolontha vulgaris*) must have occurred in the soil, in the statement made by M. Reiset and quoted in "*La Nature*" for the 18th of May, where it is stated that in a field of about one hectare (2.471 acres) a single woman collected 759 pounds (344 kilograms) of these White Grubs or Cock Chafer larvæ in 15 days. The actual number of grubs was estimated at 180,000.

A WHEAT PEST IN CYPRUS.

Mr. A. E. Shipley, of Cambridge, England, has just published a preliminary report on the species of Tineina which injures wheat crops in Cyprus (Bulletin of Miscellaneous Information, Royal Gardens, Kew, No. 30, June, 1889, pages 133–135). This insect is *Œcophora temperatella*, a species which occurs at Beyrout and Libya, and is widely distributed throughout Palestine. The damage is done by the larva in mining the leaves and stems of the wheat. Many thousands of bushels of grain are lost through its work. The information which Mr. Shipley has received has so far been very fragmentary.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

June 27, 1889.—Mr. G. W. J. Angell, of New York City, was elected a corresponding member of the society.

Dr. Marx read a note giving the record of the numbers (216,000,000) of May beetles collected and destroyed in Tuchel, Pomerania. Mr. W. H. Ashmead read a descriptive paper entitled "An Anomalous Chalcid," in which he erected a new genus and species (*Hoplocrepis albiclavis*), for a Chalcid collected by the late Dr. R. S. Turner, at Fort George, Fla. The paper was discussed by Messrs. Howard and Schwarz.

Mr. L. O. Howard called the attention of the society to some enlarged figures of the mouth parts of *Periplaneta orientalis* in Miall and Denny's work on the Cockroach, in which no indication is given of a *digitus* proceeding from near the tip of the *lacinia* corresponding to the one occurring in *P. americana* described by him at a recent meeting of the society. Mr. Howard then briefly reviewed Miss Ormerod's recent book on South African Insects, and concluded his contributions by reading Hy. Edwards's paper, prepared for INSECT LIFE and published in the present number, on Noises made by Lepidoptera. This very interesting paper called forth a considerable discussion by various members relative to the noises of Lepidoptera and other insects.

Mr. E. A. Schwarz presented a paper entitled Myrmecophilous Insects and a catalogue of Myrmecophilous Coleoptera, exhibiting specimens of the Coleoptera treated. The paper was a very valuable contribution to our knowledge of the insect parasites and messmates of ants, and was discussed by Dr. Marx, Mr. Ashmead, and others.

C. L. MARLATT,
Acting Recording Secretary.

U. S. DEPARTMENT OF AGRICULTURE.

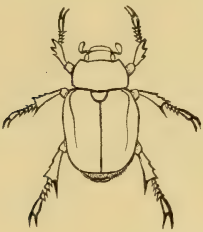
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. AUGUST, 1889.

Vol. II. No. 2.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS.



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SPECIAL NOTES.

The Grain Louse.—The common Grain Aphis (*Siphonophora avenæ*) has quite outdone itself this season. Appearing in enormous numbers in parts of Illinois, Indiana, Michigan, Wisconsin, and Ohio, it remained in the fields much later than usual, and it was not until nearly time for wheat harvest that its natural enemies had sufficiently increased to destroy it. Toward the end the parasites and predaceous insects were present in startling numbers and we have been able to rear many new ones, as well as to recognize at least two of Fitch's species. The insect enemies which we have so far found comprise eight species of hymenopterous parasites, one dipterous parasite, three species of Syrphid flies, two Chrysopas, and a number of Coccinellids.

The Grain Louse itself is a difficult insect to fight, and it is most fortunate that it is usually killed off by its enemies before appreciable damage is done. Its operations this year have doubtless caused some shrinkage of the crops, the amount of which can not be estimated at the present time.

The proposed Economic Entomologists' Union.—At about the time when this number of INSECT LIFE is being mailed an earnest discussion as to the advisability of such an association as we proposed in our January number will be going on at Toronto. Mr. James Fletcher, Dominion Entomologist of Canada and president of the Entomological Club of the American Association for the Advancement of Science, impressed with the great desirability for such an association and encouraged by favorable comments from a number of prominent workers, has issued a call for a preliminary meeting at the Toronto meeting of the American Association for the Advancement of Science.

We earnestly hope that an organization will be effected, for we feel sure that it would result in great benefit to the members and to the country at large.

Statistics of Loss from Insects.—As a contribution to the interesting study of the damage done by insects, computed in dollars and cents, we publish in this number a careful summary of the damage done by

Cotton Worms in Texas during 1887, compiled from the first annual report of the commissioner of agriculture of Texas, by Mr. B. W. Snow, assistant statistician to this department. This summary had been promised us by Mr. Dodge, but as he was called away Mr. Snow has kindly prepared it for our use.

Professor Cook's Bulletin on the Grain Louse.—Prof. A. J. Cook has just published, as Bulletin No. 50 of the Michigan Experiment Station, a short account of the Grain Plant-louse, giving a brief summary of the known facts concerning this insect. The bulletin is preliminary in its character and no remedies are suggested.

East Indian Rhynchota.—We have just received from Mr. E. T. Atkinson a continuation of his valuable papers upon this subject. The present installment comprises some nine y pages and includes descriptions of species numbered 295 to 443.

AGGREGATE DAMAGE FROM COTTON WORMS IN TEXAS, CROP OF 1887.

By B. W. Snow, *Assistant Statistician.*

The commissioner of agriculture of Texas, in his first annual report, presents a statement of the aggregate cotton crop of that State for 1887 by counties. In many parts of the State the season was an unfavorable one for this crop, drought and worms very much reducing the yield per acre. An estimate of the damage done by worms is presented for each county, ranging from nothing in many counties to a loss of 50 per cent. of the crop in others of large production, and an even heavier loss in some counties where the crop is of little importance and insecticides are not made use of. For the whole State the amount of damage done averaged about 21 per cent. of the crop.

According to this return the total number of bales gathered was 1,125,499, while had there been total exemption from insect damage the farmers of Texas, according to this authority, would have gathered a crop of 1,422,948 bales. This would make the aggregate loss from worms equal to 297,449 bales. The value per bale of the crop which was made at the place of production averaged slightly over $40. Presuming that an increase of less than half a million bales in the aggregate crop would have made but little difference in price, the actual money loss to the farmers of Texas in one year from the Cotton Worm alone was $11,897,960.

It is not claimed that these figures are absolutely accurate, but they are undoubtedly approximately correct, and will give some idea of the enormous tribute levied upon American agriculture by injurious insects. In that year Texas produced but 21 per cent. of the cotton crop

of the country, and the Cotton Caterpillar and Boll Worm were active in all sections of the cotton belt. The injury elsewhere may not have been so heavy, but it would swell the aggregate loss in one crop to startling proportions.

The following statement has been prepared from the data presented in the report quoted from, and shows by counties the actual crop gathered, with the aggregate product which would have been picked had there been no loss from worms. In a number of counties damage from worms is not mentioned, and it is presumed that no loss occurred.

Counties.	Bales.	Loss from insects.	Product without loss.	Counties.	Bales.	Loss from insects.	Product without loss.
		Per cent.	*Bales.*			*Per cent.*	*Bales.*
Anderson	11,818	20	14,773	Hardin	94	$33\frac{1}{3}$	141
Angelina	2,629		2,629	Harris	2,781	23	3,612
Atascosa	348		348	Harrison	15,556	10	17,284
Austin	17,378	12	19,748	Haskell	16	29	23
Bandera	144		144	Hays	3,253	$4\frac{5}{10}$	3,406
Bastrop	13,274	18	16,187	Henderson	8,773	17	10,570
Baylor	9		9	Hidalgo	146	$89\frac{9}{10}$	1,446
Bee	121		121	Hill	13,188	58	31,400
Bell	21,481	20	26,851	Hood	1,082	87	8,323
Bexar	1,268	34	1,921	Hopkins	14,230	20	17,788
Blanco	890	25	1,187	Houston	10,716	10	11,907
Bosque	3,618	36	5,653	Hunt	29,701	12	33,751
Bowie	6,679	25	8,905	Jack	1,088	5	1,145
Brazoria	6,344	25	8,459	Jackson	741	25	988
Brazos	14,229	15	16,740	Jasper	1,099	20	1,374
Brown	2,374	39	3,892	Jefferson	87	25	116
Burleson	10,489		10,489	Johnson	11,489	33	17,148
Burnet	1,849	15	2,175	Jones	366	32	538
Caldwell	8,669	8	9,423	Karnes	967	44	1,727
Calhoun	2	50	4	Kaufman	21,236		21,236
Callahan	745	25	993	Kendall	419	$\frac{4}{100}$	421
Cameron	390	25	520	Kerr	256	40	427
Camp	4,356	20	5,445	Knox	1		1
Cass	13,546		13,546	Lamar	29,252	38	47,181
Chambers	29	25	39	Lampasas	783	20	979
Cherokee	13,137	10	14,597	Lavaca	15,246	20	19,058
Childress	2		2	Lee	8,126	11	9,130
Clay	533	10	592	Leon	9,443	10	10,492
Coleman	469	48	902	Liberty	1,693	20	2,116
Collin	33,112	17	39,894	Limestone	13,020	25	17,360
Colorado	20,526	15	24,148	Live Oak	33	5	35
Comal	2,315	20	2,894	Llano	761		761
Comanche	4,894	44	8,739	Madison	4,252	8	4,622
Concho	19	45	35	Marion	6,165	5	6,489
Cooke	11,109	45	20,198	Mason	725	11	815
Coryell	6,161	5	6,485	Matagorda	3,123	26	4,220
Dallas	27,796		27,796	McCulloch	167	25	223
Delta	8,514	24	11,203	McLennan	16,823	40	28,038
Denton	13,288	30	18,983	McMullen	4		4
De Witt	7,565	25	10,087	Medina	178	5	187
Duval	52	50	104	Milam	14,773	23	19,186
Eastland	2,456	32	3,612	Mills	369	63	997
Edwards	13	20	17	Montague	7,548	14	8,777
Ellis	40,735	19	50,290	Montgomery	5,315	10	5,906
Erath	5,375	44	9,598	Morris	3,702		3,702
Falls	9,750	15	11,471	Nacogdoches	9,468	5	9,966
Fannin	38,296	10	42,551	Navarro	11,730		11,730
Fayette	35,187	13	40,445	Newton	1,036	13	1,191
Fisher	62	1	63	Nolan	3		3
Fort Bend	10,139	25	13,519	Nueces	3		3
Franklin	3,897	21	4,933	Orange	142	34	215
Freestone	6,202	34	9,397	Palo Pinto	803	34	1,217
Frio	215	5	226	Panola	12,658	5	13,324
Galveston	38		38	Parker	4,786	31	6,936
Gillespie	1,454	25	1,939	Polk	3,214	8	3,493
Goliad	2,806	32	4,126	Rains	3,795	20	4,744
Gonzales	10,382	15	12,214	Red River	22,512	25	30,016
Grayson	24,904	29	35,076	Refugio	62	44	111
Greer	311	48	598	Robertson	18,963	25	25,284
Gregg	4,854	10	5,393	Rockwall	6,665	50	13,330
Grimes	16,563	12	18,822	Runnels	52	90	520
Guadalupe	9,376	20	11,720	Rusk	15,967	20	19,959
Hamilton	1,940	55	4,311	Sabine	2,917	12	3,315
Hardeman	10	50	20	San Augustine	4,156	11	4,670

Counties.	Bales.	Loss from insects.	Product without loss.	Counties.	Bales.	Loss from insects.	Product without loss.
		Per cent.	*Bales.*			*Per cent.*	*Bales.*
San Jacinto	5,342	15	6,285	Val Verde	5	....	5
San Patricio	160	50	320	Van Zandt	10,482	20	13,103
San Saba	708	8	770	Victoria	3,710	33	5,537
Shackelford	145	....	145	Walker	6,726	19	8,304
Shelby	11,415	....	11,415	Waller	7,823	15	9,203
Smith	16,589	20	20,736	Washington	30,644	13	35,223
Somervell	498	95	9,960	Wharton	8,875	18	10,823
Stephens	1,044	10	1,160	Wichita	39	55	87
Tarrant	9,781	26	13,217	Wilbarger	32	17	39
Taylor	209	5	220	Williamson	11,391	15	13,401
Throckmorton	7	....	7	Wilson	3,793	32	5,578
Titus	5,844	15	6,875	Wise	5,495	38	8,863
Tom Green	21	....	21	Wood	8,881	30	12,687
Travis	18,664	8	20,287	Young	391	16$\frac{66}{100}$	469
Trinity	3,759	2	3,836	Miscellaneous	27,150	....	27,150
Tyler	2,788	36	4,356				
Upshur	8,212	22	10,528	Total	1,125,499	....	1,422,948
Uvalde	22	....	22				

A NEWLY-IMPORTED ELM INSECT.

By L. O. Howard.

Our first knowledge of this insect in this country was gained in 1884, when Mr. Charles Fremd, of Rye, Westchester County, N. Y., wrote Professor Riley, under date of June 22, as follows:

My elm trees in the nursery are troubled this year with a red-looking mealy bug. Thousands of them are between the cracks of the bark, and are destroying the vitality of the trees. I have made one application of kerosene emulsion, but I presume not strong enough. I will go over them again with a stronger emulsion. * * *

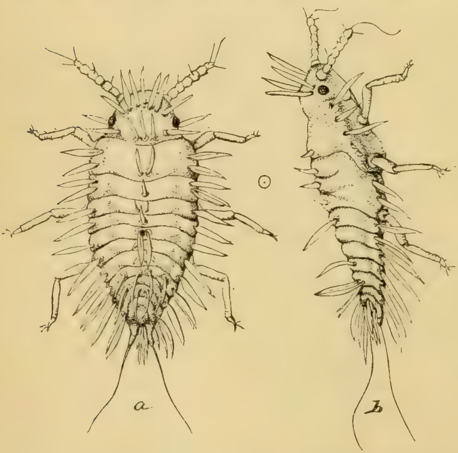

Fig. 1.—Gossyparia ulmi: *a*, young larva from above; *b*, young larva from side—greatly enlarged (original).

Professor Riley was in Europe at the time, and we therefore wrote Mr. Fremd for specimens, which he promptly sent, June 30. All of them had been saturated with kerosene emulsion, however, and were not in fit condition for study. It was plainly to be seen that they were new to the Coccid fauna of the United States, and our impression then was that they belonged near the genus *Eriococcus*.

The following month Mr. Fremd sent other specimens, all old females, and offered as a surmise as to the cause of their occurrence on his place the suggestion that they were very similar to bark-lice which he had noticed four or five years previously on some Chinese azaleas which he had procured from a New Jersey nursery, and which ultimately died, perhaps from the effects of the remedies applied for the Coccids.

This information unfortunately put us on the wrong track, and, supposing that it might be a new Chinese insect, we allowed other more important matters to intervene.

In June, 1887, this insect was sent to the Department again by Mr. John G. Jack, who found it at Cambridge, Mass., on the bark of *Ulmus fulva* (Slippery Elm). In Professor Riley's absence we wrote Mr. Jack the facts which had come to our notice, and that the species was undetermined in the collection of the National Museum and the Department of Agriculture, and advised him to send specimens to Professor Comstock, who was studying the group critically. A month later Mr. Jack wrote that he had followed our advice and that Professor Comstock reported that the species was undetermined, that it had been in his collection for some time, and that the previous winter he had found that it occurred abundantly on some elm trees in New York City.

In the summer of 1888 Mr. Jack sent other full-grown specimens, and the same summer it was found upon several elms in the grounds of the Department of Agriculture, at Washington, by Mr. W. B. Alwood. In the fall of 1888 we found it also upon *Ulmus americana* in two localities in the streets of Washington. Up to this date only old females had been found, and these presented much the appearance of *Eriococcus azaleæ* Comst.,* except that the white, somewhat ribbed excretion is not continuous over the back, but is abundant around the sides, curling up over the back and leaving the central portion brown and bare.

April 29, 1889, Mr. Jack sent to the Department some bits of bark and small limbs carrying non-impregnated females, male cocoons, and just-issued males, and, as Professor Riley was again unfortunately absent, this time as representative of the Department to the Paris Exposition, we undertook some further study of the species from Mr. Jack's material, and from that found in Washington had careful drawings made, and had little difficulty in determining that the insect was identical with the European *Gossyparia ulmi* Geoffroy, described by Signoret in the *Annales de la Société Entomologique de France* for 1875, page 21, and which occurs commonly upon *Ulmus campestris* in Europe. According to Signoret, *alni* Modier, *farinosus* De Geer, *spurius* Modier, and *lanigera* Gmélin are synonyms of this species. The specific name of the first-mentioned synonym would indicate that the species also occurs upon *Alnus*, and indeed Signoret states that he has collected it in the Bois de Boulogne on Alder.

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* This was probably the scale which Mr. Fremd noticed upon his Chinese Azaleas and which he confounded with his Elm Coccids.

Signoret describes the newly hatched larva, the adult female before and after impregnation, and the immature male. Concerning the latter stage he writes:

We have collected a large number of active male nymphs, but no complete males. As with the preceding genus [*Nidularia*], when one disturbs these insects during their state of metamorphosis, they are apt to run away. This is what M. Lichtenstein has noticed with *Dactylopius vitis*, which he has pointed out as having an active nymph; but, according to us, it is to avoid danger, and under natural conditions the nymphs do not leave the sort of sac which serves them as a cradle [*berceau*].

In this conclusion Signoret has been at fault. The true pupa is not active, and from the nature of its sheathed limbs can not be active. The form which Signoret describes and calls the "nymph" casts off the pupa skin while yet in the cocoon and issues with its wings as yet unfolded and represented simply by pads, as shown in Fig. 3. It remains in this condition for some time (several days ?), runs freely about, with great activity, as we have seen, and, according to Mr. Jack's observations, even copulates with the female before its wings expand. It was in this condition that Signoret always found it. Others issue later with expanded wings and of the appearance shown in Fig. 5*c*, possessing long anal filaments. No casting of the skin has been observed between the two stages, but one may have taken place, and the form with the wing pads should be considered a pseudimago comparable with the form so-called in the Ephemerids.

Signoret's descriptions of the different stages are sufficiently accurate, and we may simply give a brief résumé of the appearance, adding a fuller description of the adult male.

The newly hatched larva is of an elongated oval form, narrower behind, of a clear yellow color, each segment with a strong lateral spine and the front border of the body with six spines. The genito-anal ring has six hairs, around which is later formed a secretion which renders them invisible. There is a double row of spines down the middle of the back; the antennæ are six-jointed, the first three joints longest, the fourth and fifth shortest. (See Fig. 1.)

The adult female before impregnation is of a similar shape, but the terminal lobes of the abdomen are more developed. Each segment is covered with spiny spinnerets secreting wax. The antennæ are six jointed, second and third longest, fourth and fifth shortest. There is an elongated protuberance each side of the antennæ. The legs are short and slender, with the tibia shorter than the tarsus. The genito-anal ring has 8 hairs. (See Fig. 5*a*.)

The full-grown male larva has seven-jointed antennæ, joint 7 longest, the rest equal. After impregnation the female becomes more round, fixes herself, the secretion becomes much more abundant on the sides, making at first lammellæ, which afterwards unite into a continuous cushion. The back becomes smooth and the segmentation is plainly visible. The dorsum is plane transversely, but curved longitudinally. Particularly after the birth of the young, the female becomes well

separated from the waxy cushion and is easily removed from it (even jarring will accomplish the removal), leaving the noticeable empty white cup with its fringed edges. (See Fig. 2.)

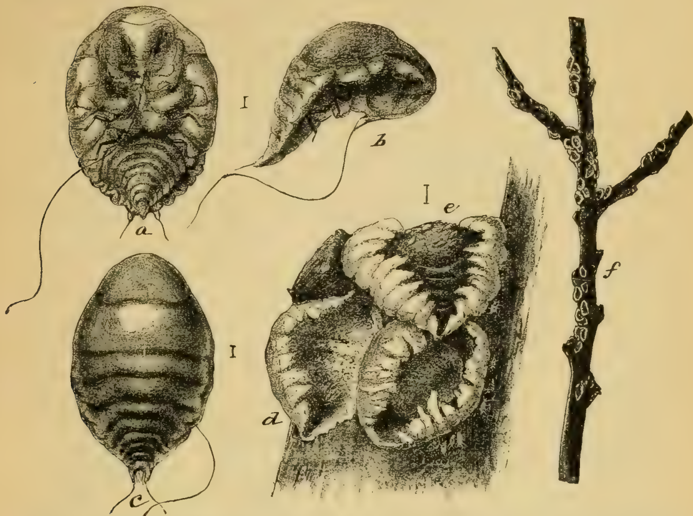

Fig. 2.—GOSSYPARIA ULMI: *a*, adult female from below; *b*, adult female from side; *c*, adult female from above—all greatly enlarged; *d*, empty waxy cushion; *e*, females in natural position—enlarged; *f*, shrivelled females—natural size (original).

The male presents a puzzle, and neither Mr. Jack's observations nor our own have solved it. The active form with wing pads issued some days before fully-fledged males were noticed. Specimens under observation in Washington were observed to copulate in this condition. The antennæ are ten-jointed, the joints well separated; the wings are represented by pads of varying length. The poisers appear rather thick and fleshy, but lack the terminal hook. The abdomen is very stout, suboval, considerably broader than the thorax, and when seen from above covers coxæ, trochanters, and bases of the femora. Its segments are not well marked. (See Fig. 3.)

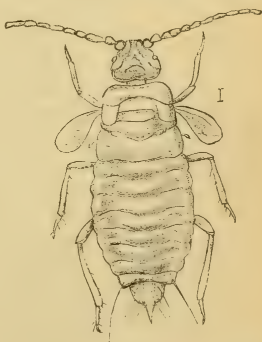

Fig. 3.—GOSSYPARIA ULMI: Imperfect male—greatly enlarged (original).

A few days after this form makes its appearance the cocoons begin to give out the perfect males, which issue with wings fully expanded. (See Fig.

5 *c*.) There really seems to have been a molt between this pseudimago and the perfect male, for in no other way can we account for the difference in form. The antennæ possess the same number of joints (ten) of about the same relative proportion, although joints 3 and 4 are longer, but the incisures are rather better marked. The poisers are lighter in color and less fleshy in appearance, and the curved hook is plainly visible at tip. The abdomen is rather longer, much more slender, and tapers gradually from base to tip. Its segments are well incised and plainly separable from above. It does not cover the hind coxæ and trochanters. The tibiæ are longer in proportion to their tarsi. The anal segment gives off two waxy filaments as long as the entire body. These filaments were not noticed in the pseudimago.

The cocoon itself is rather close though thin, flattened oval, and pure white, about 2^{mm} long by 1^{mm} wide, and is composed of rather coarse wax fibers. (See Fig. 4.)

Fig. 4.—GOSSYPARIA ULMI: Cocoon of male, showing anal filaments and edges of wings extruding—greatly enlarged (original).

According to one season's observations, therefore, this peculiar pseudimaginal form issues under perfectly natural conditions several days before the true imago; it is active and copulates. We have not observed it develop into a true imago. We have seen the true imago, however, issue from the cocoon, fully fledged, several days later. Why it ever issues as a pseudimago we do not know. That this is common is shown by the observations of Signoret, who never saw the fully-fledged male. We are not certain whether the copulation of the pseudimago with the female is a perfect one or is abortive and prompted by premature instinct, although the intromittent organ of this form is apparently complete and unsheathed.

From Mr. Jack's notes and our own observations at Washington we are able to give the round of the insect's life in general terms. The young lice are apparently born viviparously as with the Mealy Bugs, and issue from their living mothers in late June and early July and scatter actively over the tree, the majority of them with *Ulmus fulva* in which the twigs are pubescent or bristly, settling temporarily upon the leaves, mainly upon the upper surface in the angles of the midrib and principal veins, but also upon the under surface. With *Ulmus racemosa*, however, the twigs being smooth, large numbers settle about the buds and on the surface of the twig, many others also occurring on the leaves. With *Ulmus montana*, which is the species upon which we have principally studied them, they settle very abundantly upon the under sides of the leaves along the midrib and preferably just at the forkings of the veins. We have never found them settled upon the upper surface of the leaves, nor, in this stage, upon the twigs.

In August the lice desert the leaves and new twigs and return to the larger branches and trunk where they soon settle themselves in crevices of the bark. At this time they secrete a great deal of honey-dew which attracts ants and other insects, and gives off curiously enough a pungent odor which Mr. Jack states is noticeable where large numbers of the coccids are at work, but which we have not noticed at Washington, probably on account of the comparative scarcity of the lice.

This settling into the crevices of the trunk and limbs is purely for hibernation and is not a permanent fixture, as when Mr. Jack took some branches into the house in December they became quite active, moved about the limbs and escaped to different parts of the room.

As warm weather comes in the spring they begin moving once more, the females cast their last skin and the males form their cocoons. The adult males issue about May 1, and while still in the pseudimago state, were observed both in Cambridge and at Washington in many cases to copulate with the females. The fully developed males are seen in abundance a few days later; the great majority of the late ones issuing from their cocoons with the wings fully expanded and the anal filaments complete. Indeed the long filaments protrude from the cocoon and by laying hold of them the insect can be pulled out. It issues naturally backwards as do the males of other Coccidæ.

Soon after copulation the females fix themselves permanently and the males disappear. This occurs the latter part of May. The females at this time are attached mainly to the trunk and larger limbs. From this stage (the impregnated female) the secretion of honey dew is more pronounced than from the young females described in an earlier paragraph. It is given off in minute drops, which, according to Mr. Jack, are plainly visible while falling in the bright sunlight. The trunk, branches, and lower leaves are blackened, and many ants, wasps, and flies, as well as some beetles, are attracted.

The young lice begin to hatch in from three to four weeks after impregnation, and thus the life round is completed.

Mr. Jack's original specimens were found upon *Ulmus fulva* in the Arnold Arboretum near Boston, and he afterwards found the species quite widely distributed in the vicinity of Boston, occurring upon *U. americana* and *U. racemosa* as well as upon the European species, *U. montana* and *U. campestris.* He found it more common on the American species than upon the European, and more abundantly upon *U. fulva* than upon *U. americana.* Upon the latter species he found that the Coccids preferably left the coarse bark of the trunk and ascended to the higher parts of the tree.

In Washington specimens have been found upon the Department grounds in considerable numbers only upon one of the varieties of the European *Ulmus montana* (probably var. *rubra*), only occasional specimens being found upon *U. campestris* and the American species growing side by side with *U. montana.* *U. fulva*, which is so badly infested

at Boston, is apparently untouched in Washington. In other parts of the city the Coccids have been found in several instances upon the trunks of the large *U. americana*, but these trees are too tall to mount readily to ascertain the numbers on the limbs. On the infested *U. montana* at the Department the old females cluster thickly along the under sides of the lower limbs, and through July the young are scattered over the leaves feeding vigorously and growing rapidly. Were we considering this question of the varieties attacked from the Washington trees only we could very plausibly account for the occurrence of the species so abundantly upon *montana* and not on *campestris* for the reason that the leaves of *campestris* are completely skeletonized every summer by the larvæ of the imported Elm-leaf Beetle, while the leaves of *montana* are only partly eaten, thus giving the young Coccids abundant opportunity to develop on the latter and none at all on the former species; but unfortunately the facts from Cambridge obviate this simple conclusion.

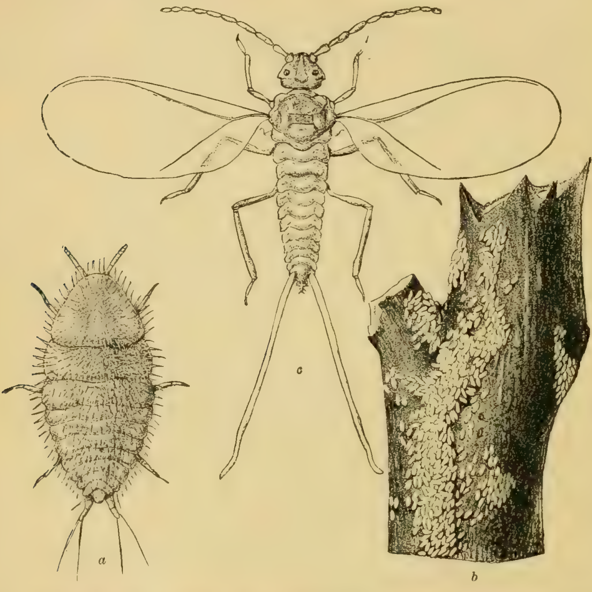

Fig. 5.—GOSSYPARIA ULMI: *a*, female before impregnation—greatly enlarged; *b*, male cocoons in natural position on limb—natural size; *c*, perfect male—greatly enlarged (original).

Upon ascertaining definitely during May the identity of the species with the European *Gossyparia ulmi* it immediately occurred to us as a matter of course that it was quite natural that the insect should be abundantly found in the two localities of Boston and Washington in

the arboretums in which European elms were largely growing; but there was still their earlier occurrence at Rye, N. Y., to be explained. We therefore wrote to Mr. Fremd, June 26, to ascertain whether there were any European elms in his vicinity and whether the insects had increased, and received promptly the following very satisfactory reply:

I am just in receipt of yours, and will answer at once. At the time I wrote to you, in 1884, regarding the elm louse, I had several hundred of European elms in the nursery, and there are also quite a number of large trees, etc., in a number of lawns about Rye. The louse has disappeared from our trees altogether, how I don't know. * * *

The probable reason for the disappearance of the insects with Mr. Fremd was his use of the kerosene emulsion in 1884, as he wrote us under date of June 22, 1884, that he had used a weak emulsion and was about to try a stronger one. This leads us to Mr. Jack's statement that whale-oil soap with kerosene was successfully tried against the old scales on the trunks and larger limbs in the Arnold arboretum, but those upon the smaller limbs escaped. He did not know the strength of the solution.

This finding of *Gossyparia ulmi* upon American elms and upon European elms in this country was quite to be expected, and the only wonder is that it has not been found and recognized before. The species of Coccidæ have already extremely wide ranges, and every season still further extends them. Of our admitted North American Coccid fauna twenty-three species are of European origin (one more doubtfully so), three are from Australia and New Zealand, while sixty-nine are either truly North American or their original home is unknown. As several of these are found only on hot-house plants, they are certainly not North American. Several others are found on both native and imported plants and there are no data upon which to decide upon their proper faunal position. The fact that the *Gossyparia* prefers American elms at Cambridge is by no means without precedent in the group, and as another instance it may be mentioned that the beautiful oak-scale *Asterodiaspis quercicola* (Bouché), recognized by Comstock in 1880 upon foreign oaks on the Department of Agriculture grounds, is at the present time to be found almost solely upon American oaks in the same grove.

Since the completion of this article Professor Comstock has written us that he had himself recently decided that this insect is the European *Gossyparia ulmi*, and states that last winter he found it abundant upon elms in Saxony. He also states that it has been sent him by Mr. Henry Edwards from New York City, and by Dr. Lintner from Marlborough, N. Y. Mr. Edwards informs us by letter that his New York specimens were obtained from English elms of three years' growth.

SOME MICHIGAN NOTES RECORDED.

By Tyler Townsend.

The few notes here incorporated are selected and rewritten from an account of injurious insect appearances in the vicinity of Constantine, St. Joseph County, Mich., prepared by the writer three years ago (1886), and which it is not now thought advisable to publish in its original condition. The majority is omitted, only a few points being brought out which are considered of sufficient interest to be worthy of record.

Passing the Hymenoptera with the remark that the Raspberry Saw-fly (*Selandria rubi*) did some yearly injury from 1881 to 1886, we find in the Lepidoptera a number of species to be noticed. Of the two Cabbage Butterflies (*Pieris oleracea* and *rapæ*), it is worthy of note that the native species was (up to 1886) usually the more abundant, both species, however, being quite injurious every year. Scudder records *P. rapæ* as reaching this part of Michigan in 1877, on the authority of A. J. Cook and E. W. Allis. Thus for ten years at least the native butterfly has held its own against the foreign one, as it seems to have done for a shorter period of time in Colorado (see INSECT LIFE, I, p. 382).

The Peach-tree and Currant Borers (*Ægeria exitiosa* and *tipuliformis*) are prominent, the first, aided perhaps by the hard winters, having exterminated the peach crop in this neighborhood. For several years up to 1881 a fine crop of this fruit was realized, and that year there was a splendid yield. In 1882 the yield was very small, many trees having died. Since then the trees were especially infested with this borer, which had previously been gaining steadily in its injuries for several years, and many trees had died every year, while none yielded fruit, until in 1886, in this immediate vicinity at least, hardly a live peach tree was to be found.

The Orange-striped Oak-worm (*Anisota senatoria*) was very abundant from 1879 as far back as 1874, stripping red oaks especially of their foliage to an alarming extent. It gradually became less injurious each year until it almost disappeared. With the exception of a few isolated larvæ seen in 1886 and some a year or two before, there had been none noticed for several years back. Accounts this year (1889) indicate that it has again made its appearance.

The Boll Worm (*Heliothis armigera*) came under notice only once during a period of twelve years. This was in 1881, when the worms were frequently met with in ears of green corn. The Army Worm (*Leucania unipuncta*) also appeared here in 1881, being in good force and entirely destroying many fields of grain, especially oats.

In 1886 the moths of a species of *Agrotis* (probably *subgothica*) were found in great numbers about houses, being especially numerous and

active every evening during the latter part of May, the whole of June, and the first part of July, swarming on the upper-story windows of houses.

In the Diptera several species never known to be injurious occurred at times in some abundance. A very sleek-looking, black, pubescent fly (*Laphria canis* Will., determined for me by Dr. Williston) appeared in very large numbers in May, 1886. They covered the grass as well as raspberry and currant bushes, and were to be seen on almost everything, yet it could not be ascertained that they did any injury. The species passes its larval state in the ground, probably feeding on the roots of plants or other vegetable substances, while in the perfect state, together with other members of its genus, it is rapacious. Some members of the family are even predaceous in their larval state, devouring the larvæ of beetles found in grassy places (Williston). In two local lists of Diptera, one of Montreal and the other of Philadelphia, this species is not included, but it was described by Dr. Williston from two specimens, ♂ and ♀, taken in Connecticut, June 25. Three other Diptera were observed in considerable numbers on currant bushes in 1882, on May 9 and later in the same month. They are *Bibio femoratus* Wied., ♂ and ♀, a smaller undetermined species of *Bibio*, and *Scatophaga stercoraria* Linn. The first of these is given the locality "Atlantic States," in Osten-Sacken's list, and in the local lists just mentioned is recorded from Philadelphia, but not from Montreal; the last species occurs in both local lists. These three species appeared in more moderate numbers at the time than did *Laphria canis* in 1886, but were still quite numerous. They doubtless occur in smaller numbers every year, but were not noticed as particularly abundant after 1882.

Of the Coleoptera, one of the May beetles, *Lachnosterna prunina*, rather rare in collections, though locally abundant as will be seen, occurred in good numbers in 1886 on raspberry, blackberry, oak, and apple, in the evening, and there is good reason to believe that it has been numerous in previous years. It first appeared May 2. On May 22, at 11 o'clock in the evening, 82 specimens were beaten from raspberry bushes in the course of a half hour. It would seem that where there were so many of the beetles on the leaves they would be apt to cause some damage, yet the leaves had not been eaten. The beetles were abundant only on bushes in grass or sod, those kept clean of grass and weeds yielding very few specimens in proportion. In the larval state this species is, as are its congeners, destructive to the roots of grass. Numbers of the beetles were found every fine evening buzzing about in the grass in various places and finally flying away, these being no doubt individuals which had but recently emerged from the pupa state. This is in explanation of their being found in abundance only on the bushes that were in grassy places.

In the Hemiptera, Brood XXII of the Periodical Cicada may be re-

corded for this locality in 1885. Several other insects in this order may be noticed. Prominent among them is the Grape-vine Leaf-hopper (*Erythroneura vitis*) which was very abundant in all its stages during the first part of September, 1886, on the leaves of the grape. It caused considerable injury by puncturing and thus disfiguring the leaves. The perfect insects that were noticed here did not have the transverse reddish bands nearly so broad as generally represented in the figures of them, but very narrow, while all the rest of the insect is of a pale yellow.

The Grain Plant-louse (*Siphonophora avenæ*) occurs some years on wheat and oats, but has never done particular damage. However, this year (1889), reports from the vicinity of Constantine, and the local papers, state that it has appeared in large numbers.

The Maple Scale (*Pulvinaria innumerabilis*) was very abundant on the maples in 1884, being conspicuous and causing some alarm. It however disappeared without particular injury.

A greenish-yellow or grayish plant-bug (*Euschistus variolarius*) was found in some numbers in July, 1886, on red raspberries. Quite a number of the berries were noticed on the bushes, each one having a specimen of this bug upon it, which from appearances seemed to have been engaged in the nefarious practice of piercing the berry and sucking its juices. One of these individuals was a nymph. This species is very common at present, and it would not take much increase to make it abundant, in which case some of our small fruits might sustain a slight amount of injury, though nothing probably that would be appreciable.

In the Orthoptera, many species of Acrididæ are common. The Red-legged Locust (*Caloptenus femur-rubrum*) was very abundant in August and September, 1886, in clover-stubble, meadows and pastures, and along roadsides everywhere; yet they were not particularly injurious. Specimens were taken *in coitu* from September 3 to October 12 on fences along the roads in the country. The first winged specimens were noticed this year on August 9. The Lesser Locust (*Caloptenus atlanis*) occurs occasionally with the preceding. This species was taken *in coitu* from September 13 to October 13. Other species occurring with these are *Caloptenus bivittatus* and *C. differentialis*, which are usually numerous. These two species were taken with *C. atlanis*, August 9, early in the morning, on hollyhock seed-cups beginning to turn yellow, which they had evidently been eating, as holes were found in their outer coverings.

PRELIMINARY NOTE UPON CHIONOBAS (ŒNEIS) MACOUNII, Edw.

By James Fletcher, Ottawa, Can.

In the *Canadian Entomologist* (XVII, p. 74, 1885) Mr. W. H. Edwards describes the male of *Chionobas macounii* from about a dozen specimens discovered June 28, 1884, by Prof. John Macoun, the Canadian Government Botanist, at Nepigon on the Canadian Pacific Railway at the northern extremity of Lake Superior. In the last week of June, 1885, the same collector took a male and two females at a far distant locality, Morley, in the district of Alberta, N. W. T., lying at the eastern base of the Rocky Mountains. Up to the present time these are the only known stations for this handsome species, which, in some respects, is the most remarkable and distinct species of the whole genus. In size and general appearance it approaches nearest to *C. californica*, but the sexual bar of *androconia*, such a conspicuous feature in the males of Chionobas, is entirely wanting in the present species. The average expanse of the wing is, ♂ 55–65^{mm}, ♀ 65–70^{mm}. In the Annual Report of the Entomological Society of Ontario, 1888, page 85, is an account of an expedition I had the pleasure of making with Mr. S. H. Scudder to Nepigon in the beginning of July, 1888, for the purpose of getting eggs so as to obtain a knowledge of the earlier stages. Although local, the species was found to be comparatively abundant and about 250 eggs were secured. To reduce as much as possible the chance of failure in breeding these were distributed to about twenty different entomologists in various parts of America and Europe. The eggs hatched in three weeks, and notwithstanding that the larvæ ate readily of all grasses and sedges offered them there was great mortality amongst the growing caterpillars, and the only specimens I know of which were carried safely through the winter were those sent to Mr. C. E. Holmgren, in Sweden, and three which I had myself at Ottawa. These hatched July 27, 1888, passed first molt August 17, grew very little before winter, and hibernated in the second stage. They were left out-of-doors upon a living plant of *Carex pedunculata* and rested exposed upon the leaves, where they finished feeding without any protection and without spinning any silk.

Fig. 6.—Œneis macounii: Full-grown larva; *A*, from above; *B*, from side, beginning of cut; *C*, from side, end of cut—natural size (original).

The cold during the first part of the winter was very severe, the mercury frequently dropping to 20° below zero (Fahr.), and this, too, without any snow upon the ground. During February, 1889, however, much snow fell, and they were covered by 4 feet of snow until the middle of March. When the spring opened three larvæ revived, but only one would feed; this passed its second molt on April 15, the third on June 13, and the fourth on July 6. In Mr. Scudder's Butterflies of New England (pp. 1775–1777), appear descriptions of the male, the female, and the first three stages of the larva. What I take to be the mature larva is figured life size above* (eighteen days after fourth molt). The general colour is grayish-brown, striped with black and pale lines. As with many other grass-feeders, this caterpillar furnishes a good instance of protective mimicry. It is extremely sluggish in its habits, generally feeding very early in the morning, and then resting for several hours, head downwards, at the base of the tuft of sedge, when the colour, shape, and longitudinal stripes give an exact resemblance to the dead leaves and scales always found at the base of these plants. The distinct dorsal and lateral stripes divide the body into widths equal to the leaves, and the faint subdorsal and stigmatal lines indicate the midribs, whilst many small black dots around these lines not a little resemble the minute parasitic fungi which so often discolour the leaves of grasses.

EXTRACTS FROM CORRESPONDENCE.

Pieris rapæ in California.

In INSECT LIFE, just received, I notice a note upon *Pieris rapæ*. In May, 1883, I captured in this place one male of that species (identified by George D. Hulst), since when I have never seen another specimen, although collecting butterflies every year, and usually extensively. That sample I have yet in my cabinet.

P. protodice is abundant here, but no great damage is done by it.—[W. G. Wright, San Bernardino, Cal., July 13, 1889.

Poisonous Spiders.

I send to-day in glass tube a specimen of *Latrodectus verecundus*, or "poison spider." It is believed to occasionally bite people, with serious effect. I have myself known two people (one of them a lady) who were bitten, presumably by this species of spider, while in privies, and both persons were seriously ill for weeks. I presume that the interest in this subject is about over; if not, I can interview the doctor who attended the lady and the gentleman bitten and send you the results of the inquiry. Personally I know that this spider frequents such places as old buildings and privies, and it is my custom always to brush out with leafy twig all dark places before running any risk.—[W. G. Wright, San Bernardino, Cal., July 13, 1889.

* This figure was drawn by Miss Sullivan from photographs and notes brought by Mr. Fletcher to Washington on a recent visit.—L. O. H.

A Spider-bite Contribution.

As my brother receives INSECT LIFE, in which I have found very many interesting things, I see that you are taking up the question of the bite of spiders and that observations are desired. Here is one which unfortunately does not accord in its results with those which have already been published on this subject.

In 1858, if I recollect rightly, being in Silao de la Victoria, near Guanajuato, they brought to me a little girl who had been bitten by one of those enormous spiders, quite common there, and which Mr. Leon Becker has named *Metriopelma breyeri*. The oblong tumified border was about 3 lines high, of a livid, violaceous color, filled with a serosity which I was not able to examine, not wishing to puncture the very thin epidermis. The center of the tumor was concave, and filled with hard pus. Eight days after the accident there was a little pain but there were no general symptoms. Unfortunately I was unable to follow the case, so that the observation remains incomplete, but I think that they would have brought the child back to me if there had been any serious consequences. It is impossible for me to recall the treatment which I employed. Since that time I have never had occasion to see any one bitten by *Metriopelma, Theridion*, or *Scolopendra*.—[Dr. Alfred Dugès, Guanajuato, Mexico, May 28, 1889.

Blackbirds *vs.* Boll-worms.

On page 351, INSECT LIFE, after comments on Blackbirds and the Boll-worm, it is remarked, "This is an interesting experience, but was the evidence sufficient," etc. To my mind it was, to encourage me that I had a friend in the blackbird, and that he was destroying boll-worms by the thousand. The facts are these:

My field of corn was in full roasting-ear, and the blackbirds were swarming in it. My hired man came to my library and told me we must get some boys with guns to shoot blackbirds, or they would ruin our corn. He added, "The neighbors are all in their corn-fields shooting to drive away the blackbirds." I told him to wait until I had time to see what the blackbirds were doing. On entering the field there were enough blackbirds in sight to have ruined the field of corn in a short time. I spent an hour or more in the field of 24 acres, and did not find an ear that showed the birds were eating the corn. The birds would light on the ears, and spend but a short time there, and pass to another ear. I noted ear after ear that I had seen a bird on, and I always waited until the bird had finished his work on it. I found on every such ear the marks of the boll-worm. They were developed enough to have commenced eating the grains. There were the evidences that the worm had been there, and I saw the blackbirds there, and making passes as if picking out the worms, and after the bird had left the ear I could find no worm. The birds seemed to be busy hunting and eating this destructive and disgusting pest. I left the field pleased and grateful to the blackbirds. I told my hired man he need not waste any time or powder on the birds. They were welcome to hunt worms, and could take what corn they wanted to make a variety. Now, this is not sufficient to show that blackbirds are in the habit of feeding on the boll-worms, I know, but it satisfied me that the birds were destroying thousands of them for me. The season was dry, the meadows were short, and the grass dried on the hillsides overlooking my bottom fields. The conditions were these corn in full roasting-ear, the earth dry, and the weather hot. The corn at husking time was not injured by birds more than usual, which is so light as to be almost inappreciable. I hope I may have opportunity this season to make further observations, and that the good work of the blackbirds may be established by many witnesses.—[L. N. Bonham, Columbus, Ohio, June 7, 1889.

Further on American Insecticides in India.

I have to thank you for No. 9 of your valuable publication, INSECT LIFE, containing my remarks upon insect pests and your foot-note to the same. With reference to my note about the Lecanium found upon Mango trees, I have since heard from Mr.

Douglas, who originally identified it as *L. acuminatum* of Signoret, that upon closer examination he considers it to be a distinct species. At his request I have accordingly described it as a new species in the April (No. 299) *Entomologists' Monthly Magazine* under the name of *Lecanium mangiferæ*. Mr. Douglas appends a note to this article in which he mentions that the specimens received from Demerara should also be referred to this species.

From small experiments with kerosene soap emulsions I feel sure that your proposed remedy would successfully exterminate the scale-bug so destructive to our coffee plants. But there are many serious difficulties in the way of its application on a sufficiently large scale. Some of these difficulties I note below for your consideration. The large size of plantations, varying from 200 to 1,000 acres, which, at the average rate of 1,500 trees per acre, gives from 30,000 to 1,500,000 individual trees to be treated on a single plantation. These plantations are situated on steep hill-sides, intersected only by narrow and rough foot-paths; consequently the liquid and apparatus would have to be transported entirely by hand labor. Unless this treatment were simultaneously undertaken by every planter, the infection would be continually re-imported. And even if united action could be made compulsory it would still be impossible to disinfect the indigenous trees and plants which at present act as reservoirs of the pest. I fear that the expenditure necessary to meet all these difficulties would be quite prohibitive. But if you still consider otherwise, and would kindly give me an idea of the probable cost of apparatus (or refer me to a manufacturer of the special nozzles and force-pumps used in this work), I would estimate the cost of the treatment and lay the plan before our Planters' Association.—[E. Ernest Green, Eton, Punduloya, Ceylon, June 1, 1889.

Reply.— * * * The fact that the crop is grown upon hill-sides and that the field is only intersected by narrow foot-paths would render one of the knapsack pumps the only one which could be used for this purpose. European manufacturers have placed upon the market a number of desirable knapsack pumps, some of them holding several gallons, and all of them fitted with some modification of the Riley nozzle, which insures a fine spray and an economical distribution of the liquid. Knowing so little about the value of the crop and the amount of damage which the scale insects really cause, I can not pass judgment upon the advisability of the introduction of this remedy extensively, but I should surely say that it would pay to import one of the Vermorel pumps complete and make some careful experiments by its use with a good emulsion. * * * [July 3, 1889.]

A new Quince Enemy.

I inclose herewith a match-box containing Quince leaves infested with insects. The Quince tree is in a garden among pears, peaches, plums, pomegranates, figs, grapes, apples, etc. This is the second year that the Quince has been infested, and to such an extent as to check its growth and render it unfruitful, but I can discern the insects on no other tree. I should be glad to know the name of the pest and how to destroy it.—[W. Jennings, Thomasville, Ga., June 24, 1889.

Reply.—Your letter of June 24 and the accompanying specimens of the insects found upon the leaves of your Quince tree have been received. The insect is one which has no distinctive common name. It feeds upon a variety of plants and is usually called, when found upon any particular one, by the name of the plant; as, when found upon hawthorn, it is called the "Hawthorn Tingis," when found upon butternut it is called the "Butternut Tingis." Its scientific name is *Corythuca arcuata*. It has not previously been recorded upon quince so far as I know, and this habit will enable it to do considerable damage when occurring in great numbers. If you will spray your trees with a dilute emulsion of kerosene and soap you will be able to destroy the insects which are now present, and if you will burn the rubbish under the tree in the fall instead of making a mulch around the base you will probably lessen the appearance next season. * * *—[June 28, 1889.]

New Food-plant and Enemy of Icerya.

* * * For the first time I have found the Icerya infesting a Conifer—the Cedar of Lebanon (*Cedrus libani*). The tree is growing in a yard in this city, and is infested with large numbers of the Icerya in all stages. In Professor Riley's report for 1886 no mention is made of this insect having been found infesting any Conifer in California, although Mr. Maskell records having found it on pines, firs, and cypress in New Zealand.

I have also to record a new insect enemy of the Icerya. Mr. J. W. Wolfskill and Mr. Alexander Craw, of this city, both of whom are close observers of the habits of insects, inform me that they saw a long, slender, pale brownish beetle—the *Telephorus consors* of Le Conte—feeding upon the eggs of the Icerya, having first torn open the cottony covering of the eggs. I have bred this beetle from a larva found under a stone near the margin of a small stream of water, but have not been able as yet to ascertain what the larva feeds upon. I confined one of them in a box with a cut-worm, the larva of *Tæniocampa rufula* Grote, but the Telephorid larva did not attack it, and finally died. Is it possible that this beetle has learned to feed upon the eggs of the Icerya from having seen the larvæ of the Australian Lady-bird do so?—[D. W. Coquillett, Los Angeles, Cal., May 29, 1889.

The Red-legged Flea-beetle Again.

In regard to the Red-legged Flea-beetle, of which we wrote you last spring, stating that they were doing considerable damage (a reply having been received from you), will say from one year's experience that they are not so damaging as was at first supposed. The beetle does not migrate, as was first supposed, but remains on or near the ground that has been recently cleared of timber. We used a solution of Paris green on our infested trees last spring, and later in the season, finding that they did not disturb the trees of any account outside of their original haunts, we did nothing further, but waited for later developments. Early in the season the trees presented a dead appearance, but later they threw out a number of side branches, and by cutting out this spring the main branches, which are dead, and otherwise trimming the trees, they look about as well as ever, but have been thrown back one year and will be later in bearing in consequence. These same insects are noticeable where they were found last year, but not in such large numbers. They are damaging trees now, but principally on ground just cleared up.—[Stover and Stover, Edgemont, Md., April 23, 1889.

The Tarnished Plant-bug on Pear and Apple.

I inclose you in package and send by to-day's mail sample of pear-tree foliage injured by what I take to be the Tarnished Plant-bug, also samples of bug. These insects have been working on the pear and apple trees ever since foliage started, and over more than half of this (McPherson) county have destroyed from one-fourth to one-third of the pear bloom and a smaller proportion of the apple. They appear to do the most damage to the tender terminal buds toward the top of the tree. The bugs are in larger quantities the present season, and, while I have observed them almost every year, this is the first time they have created such marked damage. If I am wrong in the determination of the insects let me know.—[W. Knaus, McPherson, Kans., April 20, 1889.

REPLY.—I beg to acknowledge the receipt of your letter of the 20th instant, together with specimens of an insect which is damaging the foliage of pears and apples in your vicinity. This insect is, as you suppose, the Tarnished Plant-bug, which, as you may know, has been ascertained to be synonymous with the European *Lygus pratensis* Linn., the names *lineolaris* and *oblivitus* falling before the old Linnæan title. You

are of course familiar with the habits of this bug as published in Riley's Second Missouri Report, pages 113 and 114, and in Forbes' report as State entomologist of Illinois for 1883, and in Professor Riley's report as Entomologist to this Department for 1884, pages 312 to 315. Kerosene emulsion will be the most effective remedy against it. * * * —[April 24, 1889.]

Walshia amorphella and the Loco Weed.

By to-day's mail I send you a small tin box containing a piece of the Loco Weed or Crazy Plant. You will observe that there are worms or grubs in the roots and stems. From observations made by myself and a fellow stock-grower we are led to believe it possible that the worms, eaten by stock, produce the craziness and sometimes death, instead of the plant, as is generally supposed. Upon opening animals we always find many worms. An insect lays the egg upon the plant, and the worm, when hatched, descends into the root. The insect is longish and bronze winged. We desire information as to whether our theory be a plausible one or no. If we are right in our conclusions, we hope to find some remedy. Anything you may be able to suggest or knowledge you may be pleased to impart will be very gratifying to us.—[Thomas J. Quillian, Birmingham, Huerfano County, Colo., April 9, 1889.

REPLY.—I beg to acknowledge the receipt of yours of the 9th instant, together with the box containing a piece of the Loco Weed, supposed to be infested by grubs in the roots and stems. On arrival at Washington the work done by the grubs was evident, but not a specimen of the grub itself was to be found. However, we have received what is probably the same thing on several occasions from your State, and the sender has always been under the same impression, that the worms were the cause of the peculiar effect upon live stock. The maggots are harmless larvæ of a little moth known as *Walshia amorphella*, which occurs also in other allied plants, boring into the roots and stems. It has long since been decided that the peculiar effect of Loco Weed upon stock is due to some peculiar virtue of the plant itself, which I believe can not be ascertained by chemical analysis. *Post-mortem* examinations of diseased cattle and chemical examinations of the plant itself have been made by Dr. L. E. Sayer, dean of the department of pharmacy of the Kansas State University, from whom you might be able to ascertain something of value regarding treatment. In an article published in 1887 in the *Drug Record* concerning a *post-mortem*, he shows that the disease was one of the mucous and serous membranes, and recommends the following treatment:

"Pul. ext. belladonna	grs. x.
Corrosive sublimate	gr. j. to gr. jss.
Licorice	℥j.
Glycerine	q. s.

"Mix. Make a thin paste and give a tablespoonful. The belladonna and mercury may be increased according to the severity of the symptoms. Opium, combined with belladonna, might be advantageous at the beginning of the disease. Mild and non-irritating articles of food only should be given, such as oil-cake, etc."—[April 19, 1889.]

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX,* WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

BY LORD WALSINGHAM.

[*Continued from page 26 of Vol. II.*]

Lithocolletis fragilella F. & B.

The introduction of the name *trifasciella* Hw. into the North American lists rests first on the authority of Frey and Boll, who regarded specimens bred by them from *Lonicera sempervirens* as a form of this species. This was subsequently confirmed by Chambers, who, however, confused the species with his *mariæella* bred from a nearly allied plant—*Symphoricarpa.* I subsequently pointed out that *mariæella* was quite distinct from *trifasciella*, but confirmed the occurrence of *trifasciella* in America on the authority of a specimen, received from Dr. Riley, bred "from leaves of honey-suckle." I am now in a position to make further corrections. Frey and Boll in their last paper (Stett. Ent. Zeit., XXXIX, 270–271), described *fragilella* from larvæ feeding on leaves of *Lonicera albida*, and specimens of this are now before me, together with a leaf mined by the larvæ. Notwithstanding the remarks of these authors that this species is not nearly allied to any European form, I find it is so close to *trifasciella* Hw. as to be almost undistinguishable from it. It differs from that species precisely in the same peculiarity as Frey and Boll pointed out to distinguish their supposed variety from the European form, viz, in the different markings towards the apex of the wing including one extra small, white, costal streak. I have little doubt that this species is the one originally regarded by them as a variety of *trifasciella.* On again referring to the specimen received from Dr. Riley I find it to be the same as *fragilella* F. & B.; the close affinity of this species with *trifasciella* may be sufficient excuse for my previous error, as at that time I was unacquainted with Frey & Boll's species. Under these circumstances *trifasciella* must be erased from the American lists. The most noticeable characters by which *fragilella* may be distinguished from it are, first, the presence of an extra small, whitish, costal streak, beyond the interrupted third fascia, and secondly the absence of a subcostal shade of dark fuscous scaling, which in *trifasciella* commences at the base of the wing and reaches to the first fascia. In *fragilella* this fascia is densely dark-margined on the inner-side but in no one of the five specimens now before me does the dark dusting reach to the base of the wing.

Lithocolletis consimilella F. & B. and affinis F. & B.

Frey and Boll described *Consimilella* in 1873, bred from mixed mines, and in 1876 *affinis* from a red-fruited *Lonicera.* I have authentic specimens of both these from Boll's collection; *consimilella* from Zeller's cabinet, and *affinis* from Monsr. Ragonot, named by Boll, and although there is a slight difference in their size, they are scarcely distinguishable from each other. In *affinis*, the smaller of the two species, the frontal tuft is of a darker and more reddish-saffron, and the whole costal portion of the third fascia is decidedly more triangular and more conspicuous than in *consimilella*, in which it is confined to a very narrow line, scarcely wider than the black marginal dusting which precedes it. Moreover, at the base of the cilia, below the apex, there is no trace in *affinis* of the dusting of dark scales which is to be seen in *consimilella*, and the whole insect is also distinguished by a somewhat brighter and more glistening appearance, both of the ground-color and also of the silvery markings. The larva of *consimilella* being at present unknown, I hope to promote its discovery by pointing out these distinguishing differences.

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* Index to the described Tineina of the United States and Canada. V. T. Chambers. Bull. U. S. Geol. and Geog. Surv., IV (1), 1878.

Lithocolletis lucetiella Clem.

= *ænigmatella* F. & B.

I find in Zeller's collection a specimen of *ænigmatella* F. & B., received from Boll, which agrees with a specimen compared with Clemens' type of *lucetiella* in the collection of the Entomological Society at Philadelphia. I am therefore able to say that these two names are synonyms for one species, so distinct in appearance from any other known *Lithocolletis* that confusion is rendered impossible.

Lithocolletis celtifoliella Chamb.

= *nonfasciella* Chamb.
= *celtisella* Chamb.
= *pusillifoliella* F. & B.

From actual date of publication *nonfasciella* would take precedence, but both the name and the description being founded on peculiarities which only exist in worn specimens, it falls under Strickland's Rule XI: "A name whose meaning is glaringly false may be changed." Chambers himself (Bull. U. S. G. G. Surv., IV., 155) says of *nonfasciella*, "This must be dropped from the list; there is no such species. It was described from varieties and old specimens of *L. celtisella* Chamb." The name *nonfasciella* must consequently be treated as a synonym. Chambers's description of *celtifoliella* differs from that of *celtisella* especially in having a third fascia, but this appears to be very near the apex of the wing, and frequently somewhat obliterated by the dark dusting. Since Chambers has admitted that he was somewhat confused in the first instance by the apparently different habits of the larvæ, I think we may conclude that his two species, *celtifoliella* and *celtisella*, come fairly within the range of varieties noticed by Frey and Boll. In the Stett. Ent. Zeit., XXXIX, 274–5, Frey and Boll admit that their *pusillifoliella* is the same as *celtisella* Chamb., although in the notes by Professor Frey, published by Dr. Hagan (Papilio IV, 152) we find "*celtisella* Chb. 15 Ky. (new to me)." They confirm Chambers' observations as to the peculiarity of the larva mining both sides of the leaf, and remark upon the extreme variability of the perfect insect, some specimens of which might easily be regarded as belonging to a distinct form.

In the absence of further proof to the contrary I should regard *celtisella* Chamb. and *pusillifoliella* F. & B. as synonyms of *celtifoliella* Chamb.

Lithocolletis morrisella Fitch.

= *texanella* Z.

Fitch, in describing his *Argyromiges morrisella*, remarks that it differs from *A. pseudacaciella* Fitch (= *robiniella* Clem.), in that "the inner half of the fore wings is black, slightly tinged posteriorly with golden yellow, and interrupted at equal distances by three white spots or short bands narrowing towards their inner ends, and between each of these is a less distinct white spot or cloud. Forward of the anterior white spot the color is more pure and coal-black, forming an oblong square spot occupying the inner half of the base of the wing, which spot is bordered along its inner side by a slender white stripe placed upon the middle of the wing at its base, its hind end uniting with the inner end of the anterior white spot."

Now, with the exception of the intermediate white spots or clouds, which are not recognizable in Zeller's figure, the differences described are precisely those which separate *texanella* Z. from *robiniella* Clem. The dark dorsal margin is particularly noticeable in Zeller's figure and specimens (his type is now before me), and the slightest abrasion of scales between the white dorsal streaks produces the effect of an indistinct intermediate cloud. I am unable to resist the conclusion that Dr. Fitch had before him the three closely allied species which have since been found to feed respect-

ively upon *Robinia, Amorpha, and Amphicarpæa*, and are best known under the names of *robiniella* Clem., *amorphæella* Chamb., and *texanella* Z. There can be no doubt as to the precedence in nomenclature as between *morrisella* and *texanella*, if my theory is correct, the name *morrisella* having been published many years before Zeller's paper.

Lithocolletis uhlerella, Fitch.

= *amorphæella*, Chamb.
= *amorphæ*, F. & B.

Fitch's description of *Argyromiges uhlerella*, although brief, applies with sufficient precision to the *Amorpha*-mining *Lithocolletis*, described by Chambers as *amorphæella*, and by Frey and Boll as *amorphæ*. Fitch states that "it resembles *pseudacaciella* (= *robiniella* Clem.), but it is throughout of paler colors, its forewings being golden-grey" (rather than "uniform brilliant golden") and "the black dot on the tip of the wings is replaced by a short black stripe thrice as long as wide." This precisely describes the differences that separate *amorphæella* from *robiniella*, and we may at once give precedence to Fitch's name *uhlerella* for this species.

Lithocolletis ostensackenella, Fitch.

= *ornatella*, Chamb.

Another species of which the description is clear and absolutely unmistakable is *Argyromiges ostensackenella*, Fitch. Specimens of *ornatella*, Chamb., are now before me, and I can see no reason to doubt that this was the species from which Dr. Fitch wrote his description, although I have not had an opportunity of seeing his type.

Lithocolletis gemmea, F. & B.

When describing this species Frey and Boll were doubtful whether it were distinct from *Parectopa robiniella* Clem., not having properly recognized the latter species at that time, and Chambers asserts positively (Cin. Qr. Jr. Sc. I, 209–10) that *L. gemmea* F. & B. = *Parectopa robiniella* Clem. I am at a loss to understand how he could have made such a mistake. I have a specimen of the insect from the Zeller collection collected by Boll which agrees precisely with the description of *gemmea* and is so labeled. It would be utterly impossible to apply to it the description of *Parectopa robiniella*, which does not possess a transverse fascia and is of a totally different color. I observe that Chambers subsequently discovered his mistake and recanted (Can. Ent. XI, of 144–5).

L. gemmea is a true Lithocolletis and apparently a good and distinct species.

Lithocolletis ostryæfoliella, Clem.

= *mirifica*, F. & B.

Chambers suggests (Cin. Qr. Jr. Sc., I, 202) that *mirifica* may be the same as *ostryæfoliella*. I am inclined to agree with him.

Lithocolletis tritæniella, Chamb.

= *consimilella*, F. & B.

On the same page Chambers expresses his opinion that Frey and Boll have redescribed *tritæniella* under the name *consimilella*. I have a figure of a specimen of *tritæniella*, named by Chambers himself, and presented by him to the Peabody Academy of Sciences, Salem, Mass., and an authenticated specimen of *consimilella* from the Zeller collection. There is, I think, no doubt that these two names apply to the same species.

Lithocolletis guttifinitella, Clem.

Chambers (Can. Ent., III, 111) describes *æsculisella* as a variety of *guttifinitella*, but notices that the larva differs decidedly from that of the type. It seems impossible to

believe that the same species mines leaves of *Rhus toxicodendron*, one of the *Anacardaceæ*, and also those of *Æsculus glabra* belonging to the *Sapindaceæ*. He then proceeds to describe another species, *coryliella*, also very nearly allied to *guttifinitella* but feeding on *Corylus americana*, and his variety *ostryæella* mining *Ostrya virginica* is said to bear the same relationship to *coryliella* as *æsculisella* bears to *guttifinitella*. It is more possible to conceive that this is only a variety, since the two food plants belong to the same family. He gives a table showing the differences between the larvæ of these four species, or varieties, which he finds to be constant and striking. It would seem perhaps to be a somewhat arbitrary proceeding to raise to specific value an insect described as an undistinguishable variety. I shall content myself with drawing special attention to these two descriptions of supposed varieties in the hope that at some future time those who have the opportunity of breeding the species will clear up the doubts that certainly exist in my mind about them.

Lithocolletis atomariella, Z.

Zeller placed *atomariella* in his cabinet between *pastorella* Z. and *populifoliella* Tr., and the differences, although slight, are sufficient to separate it from both.

Lithocolletis salicifoliella Chamb.

This species is also very closely allied to, but distinct from, *pastorella* Z. and *populifoliella* Tr. It is in all probability identical with the larva described under the same name by Clemens.

Lithocolletis ambrosiella Chamb.

A group of species allied to this typical form has been described by Chambers and Frey and Boll. These include *ignota* F. & B., *heleanthivorella* Chamb., *bostonica* F. & B., *elephantopodella* F. & B., *amœna* F. & B., *actinomeridis* F. & B., and *nobilissima* F. & B. (the latter can only be treated as an MS. name, no detailed description having been published), all feeding upon various *Compositæ*. The name *ambrosiæella* was corrected to *ambrosiella* by F. & B. (Stett. Ent. Zeit., XXXIX, 267). *L. ignota* F. & B. seems to be the same as *heleanthivorella* Chamb., as suggested by Chambers—*ignota* takes precedence.

I have not sufficient material at hand to determine whether the other species should, or should not, be retained as distinct. For the purpose of the revised index and until more evidence is forthcoming to identify them, they must certainly be respected.

(*To be continued.*)

GENERAL NOTES.

HONORS TO AMERICAN ENTOMOLOGY.

Professor Riley, chief of this Division, has just been elected an honorary fellow of the Entomological Society of London. Dr. Riley is the third American who has received this honor, the others being Dr. H. A. Hagen of Cambridge, who was elected in 1863, and Dr. A. S. Packard, elected in 1884. The Transactions for 1888 show that there are only ten living honorary fellows.

Professor Riley has also been created chevalier of the Legion of Honor by the French Government. This action had no reference to

his official connection with the Exposition, but was taken on account of his researches in applied Entomology, particularly with reference to their value to French agriculture. This latter honor has been offered to Professor Riley before, but he has previously declined it on the supposition that an officer of this Government is not allowed to accept such decorations. His acceptance at the present time is conditional, of course, on the permission of this Government.—L. O. H.

A NEW EAST INDIAN GENUS OF COCCIDÆ.

Mr. E. T. Atkinson, of Calcutta, has just published, in the Journal of the Asiatic Society of Bengal (VOL. lviii, Part ii, No. 1, 1889), descriptions and figures of a new genus of Bark-lice found at Mungphu, in Sikkim, on *Quercus incarna*, *Castania india*, and *C. tribuloides*. The insect resembles *Pulvinaria* except that its larvæ have distinct anal tubercles. It is a Hemicoccid resembling the Lecanids in general appearance. The secretion is abundant and close during the larval state. In the second stage it becomes more waxy so as to approach, in appearance, the genus Orthesia, and the mass of wax on the leaves is more like detached or attached plates than threads.

CANNIBALISM WITH LADY-BIRDS.

Mr. J. W. Slater, in *Science Gossip* for July, 1889, states that he has seen the larvæ of *Coccinella dispar* attack the pupæ of its own species and destroy them. He has witnessed such instances of cannibalism not merely in a glass box in which he had placed some larvæ and pupæ, but on a row of currant bushes where Aphids were swarming. He fears that the Coccinellids are deliberate and habitual cannibals, and that this practice seriously interferes with the multiplication of the species and limits their usefulness as plant-louse destroyers. He has never observed the adults engaged in this reprehensible habit.

DAMAGE BY THE PEAR MIDGE.

Rev. E. N. Bloomfield, of Hastings, England, reports in the July number of the *Entomologist's Monthly Magazine* that considerable damage was done to Pears this spring in his vicinity by this insect (*Diplosis pyrivora*, Riley).

ICERYA PURCHASI NOT IN FLORIDA.

The several recent scares concerning the supposed appearance of the Fluted Scale of California in Florida appear, upon the best information which we have been able to secure, to have been founded upon errors in determination. In two instances the common Mealy Bug (*Dactylopius citri*) was the insect mistaken for Icerya, and in one case the insect causing the scare was the Florida Wax-scale (*Ceroplastes floridensis*).

A NEW STATE BOARD OF HORTICULTURE.

The legislative assembly of the State of Oregon passed last February an act to create a State board of horticulture and to appropriate money therefor. The board has been appointed and consists of one commissioner from each of five districts and one from the State at large. It has published two bulletins in circular form—No. 1, dated April 10, and No. 2, dated June 1—which deal with entomological matters. We notice from these circulars that the arsenical mixtures must be used in greater dilution than in the East. This point had already been brought out by California experiments. The Oregon people have found that one pound of London purple to 150 gallons of water will burn the foliage of apple.

THE ARMY WORM IN INDIANA.

The Army Worm has appeared this spring in several localities in the State of Indiana, and an account recently received, the latter part of June, from Mr. A. E. Mogle, of Kewanna, indicated that so much damage was being done in Fulton and other counties that our Mr. Webster was directed to visit the spot. He reached Kewanna July 3 and found that the worms had entirely disappeared. He visited the principal field infested, which was a 25-acre rye field, and found the crop a total loss. The field was on boggy land and was growing very rank, and there seemed no doubt but that this was where the insect originated. No attempt was made to save this field, but all energy was spent to prevent the worm from migrating to others by ditching and flooding the ditches. Cattle were also driven back and forth to trample upon the worms. Very few healthy pupæ were found, but many Tachinid puparia.

DOINGS OF AGROTIS CUPIDISSIMA.

In the early spring of this year and just as the buds upon grape-vines had expanded there appeared numerous examples of half grown larvæ of what afterwards yielded the *Noctua* (*Agrotis*) *cupidissima* Grote. These larvæ were in immense numbers, causing the loss of the first vintage in some vines, while in others the vines were kept alive only by the breaking forth of latent buds. This condition of things occurred over wide-spread areas in different parts of the State as far apart as Napa Valley and Tulare.

Visitations of this kind of caterpillar had not been observed before and it was chronicled as a new pest of the grape-vine. I visited the afflicted district of Napa County and found some few larvæ of *Plusia californica* and also some Mamestra-like larvæ likewise feeding upon the vines. I received many letters and consignments of worms; the persons sending always asked for remedies. As Agrotis, Plusia, and Mamestra larvæ do not ordinarily select the grape-vine as food, I concluded there must be an unusual cause. I think the cause to be this: The rain fall of this season was much prolonged; the weeds grew rank,

feeding and harboring an unusual number of Noctuid larvæ, and when plowing became practicable the worms were already of large size; the plowing destroyed their food plants so that the larvæ had no choice but to fall upon the grape-vines or perish, but they proved themselves equal to the change of pabulum.

The remedy under like conditions should be earlier plowing, but if cultivation is retarded by late rains then plowing should be deferred still later to allow the broods of caterpillars to pupate.—J. J. Rivers.

THE DISAPPEARANCE OF ICERYA IN NEW ZEALAND.

Mr. R. Allan Wight, who seems to have kept track of the Icerya in New Zealand better than any one else, in a recent letter gives the following interesting facts concerning the disappearance of this pest, apropos to a recently published statement of Mr. Maskell's to the effect that Icerya was present in Grafton Road Valley six years ago:

The Iceryæ, were not only in millions in Grafton Road Valley, as he describes *six years ago*, but such was the case *fourteen months* ago. Yes, and also at Takapuna, Ponsonby, New Market, Waikomiti, Wairoa South, and several other places, where Mr. Maskell never saw them at all. These beetles have sprung up suddenly, and the work they have done is positively incredible. In March, 1888, I passed through Auckland to go to Whangarei, in the north, to advise people on the Icerya question (it had broken out there), and I found the pest white on everything in and around the city and for 20 miles in several districts. In February, 1889, I was again in Auckland and lo, it was gone! I found some, of course, but only "here and there a one." Did I not do well, then, to advise Mr. Koebele to go to Napier, where there was still a retreating host of the enemy? Yes; and, believe me, if you can only succeed in keeping these beetles from your birds they will clear the Icerya as the sun melts the snow from the mountain. Last March I visited the Wairoa South, where I saw the last of Icerya hanging to the *Acacia undulata* twigs, with ova sacs torn and empty, and I saw thousands upon thousands of the little *C. Nova Zealandia* in imago pupa and larva form, but mostly in the two first stages. My daughter, who lives there and who inherits her father's love of nature, undertook to watch them for me, and she now reports that the Coleoptera are all gone out of sight, and no more Iceryæ are as yet to be seen.

A PECULIARITY OF CERTAIN CADDIS-FLIES.

Mr. K. Flach, in the *Wiener Entomologische Zeitung* for June 25, mentions the fact that among the species of the genera *Aderces*, *Astatopteryx* and especially *Neuglenes*, specimens occur provided with wings and large black eyes, while others are found in which these organs are rudimentary or entirely wanting. Several explanations of this peculiarity have been advanced. Gillmeister and Erichson considered the forms as distinct species. Matthews considered those provided with eyes as females and the blind ones as males. Reitter insisted that, in conformity with all known analogous cases, the blind ones are the females and those with eyes the males. Flach's investigations have, however, proven without a doubt the rather surprising fact that sexes occur in both forms indicating the existence of alternating generations, the blind form being stationary while those provided with eyes and wings are

migratory. He found *Neuglenes apterus* at different times in decaying poplars, without being able to explain how it was possible for them to get to such situations on account of their feebleness and awkwardness and the dryness of the air. The distribution of the species, however, over the whole of Europe points with certainty to a greater agility than the blind and wingless form could possibly have. In the same way Flach had not been able to explain the wide distribution in the East of the blind *Pteliolum oedipus* until the mystery was solved by the discovery of a female with well-developed eyes and wings among seventy specimens of the degraded form from the Caucasus. He concludes that as forms with eyes as a rule appear to be much scarcer than the blind ones it would be a very interesting investigation to endeavor to decide to what particular conditions of their mode of life the change is due (light or dryness), or, have such changes taken place at cyclic intervals?

CATERPILLARS STOPPING TRAINS.

Under this caption we printed in No. 1, Vol. I, page 30, an occurrence in South Carolina, which turned out on investigation to be a great exaggeration.

On June 29 of the present year we received a letter from Mr. Stark Webster, of Mattawamkeag, Me., inclosing a clipping from the *Upper River News* of May 25, detailing a very similar circumstance. Mr. Webster also stated that in the Northern Penobscot region the same worm defoliated most of the orchards and all of the poplars, leaving them as bare as in mid-winter. He also noted that many of the cocoons spun in the latter part of June contained a large white maggot. A subsequent letter, dated July 6, was accompanied by specimens in which it was seen that the insect they contained was the Tent Caterpillar of the Forest (*Clisiocampa sylvatica*), and Mr. Webster wrote further that they seemed to prefer Poplar, and also fed upon Oak and Cherry, and after all these are stripped they attack the Elm, Gray Birch, Willow, Rock Maple, and some other trees.

In the first volume of the *American Entomologist*, page 210, the occurrence of this same species upon a railroad track in great numbers was recorded.

The newspaper clipping which Mr. Webster sent is here reprinted with its head-lines, although for the sake of brevity we do not use the same display.

The grand march of the caterpillars.—They blockade a train on the Canadian Pacific.—Freight locomotives and railroad men powerless.—Mosquitoes join in the raid and do bloody work.—Additional motive power and sand effect their release.

The first freight train run in connection with the Bangor and Piscataquis over the Canadian Pacific met with a novel and what at one time threatened to be a serious as well as a laughable mishap Sunday. Our managing editor was in it. At a point a few miles from Sebois, on the Canadian road, the Messrs. Pierce Brothers, of Milo, had collected 1,500 ship knees, and Superintendent Van Zile sent down a big engine and eleven flats to draw them up to Brownville crossing.

They were loaded, and the return trip of 15 miles was begun, which occupied ten

hours. When the train had proceeded a few miles, and when it was on a short grade, it was brought to a standstill by an army of small, gray caterpillars, greasing the track and driving-wheels to such an extent as to almost entirely suspend friction between the rails and the driving-wheels. In some places they were half an inch thick, and the army stretched out 11 miles.

The night previous, as the time-keeper, who had about 20 miles to cover, was working homeward on his jigger, or railroad velocipede, he encountered the advance guard, and for half a mile pushed his machine along the rail by hand.

Section men undertook to sweep them off with alder bushes, but the slight touch of the twigs would crush them and lubricate the rails, and the mass formed like dough upon the driving-wheels.

The train in going down passed through these and others, but the big collection came during the forenoon and while the knees were being loaded. Of course, sand was used, but it did not avail much, and Superintendent Van Zile was wired, and he ordered out another locomotive from Sebois.

On her arrival there began a series of charges at that grade, which now had been liberally sprinkled with sand, but the animal life was so thick that various attempts were unsuccessful, and it was not until late at night and the sun had gone down that the creeping things desisted in their march.

With these there had come clouds of mosquitoes, and they very materially aided the other insects by pitching most vigorously into the men, seemingly drawing blood from all nationalities alike, and the sight of a sweating, swearing railroad laborer, frantically brandishing alder boughs over his head with one hand, while with the other he scraped caterpillars, was laughable in the extreme.

The matter has at once engaged the attention of Superintendent Van Zile, who is trying to find out from the encyclopedia how long the march of these Maine hosts continues, and it is quite likely that the road alongside this section will be ditched and flooded with running water. Nothing like it was ever known hereabouts before, but then sunlight was never before let into the wilds of Maine as the Canadian road has let it in, and there may be unknown difficulties to come consequent upon it.

LOCUSTS IN ALGERIA.

The French Government has lately been seriously occupied with the question of Locust ravages in Algeria, while the Algerians have been doing the best they know how to defend themselves against the plague. That they are yet unfamiliar with some of our American methods is shown by the following abstract of a communication from Constantine, Algeria, dated June 14, to the Paris *Petit Journal* of June 19.

The Algerians levied a tax of 4,000,000 francs to carry on the war against these Locusts, but unfortunately this subsidy was only available at the time when the Locusts, having passed their last stage of development, die after laying their eggs and stocking the country for another year.

The Algerians had offered pay for the collecting of Locust eggs. The price given was small (75 centimes per decaliter), but the 14,000,000 decaliters which were collected and destroyed were but a fraction of what remained.

The hatching of the remaining eggs, being retarded by violent rains, did not take place before the end of April last. As soon as the first hatching occurred vigorous measures of defense were taken by beating the ground with branches of trees in leaf.

When the Locusts have hatched in such large quantities that the force of men at hand is not sufficient to destroy them immediately after hatching, this beating is no longer employed. The *Melhafa* must then be used. This consists of a cloth 5 by 2 meters, which is set on end perpendicularly upon the ground, and folded at an obtuse angle; the Locusts are then driven into this cloth, which is then folded over them, when they are crushed, thrown into pits, and covered with quick-lime.

A last means of defense, the Cypriote machine (of which we have no description) is employed when the two former methods fail. Locusts which escape from this machine have been flying in such compact masses as to obscure the sunlight, generally flying before the wind.

All able-bodied men of any nationality, from the ages of 18 to 55, have been pressed into service. Even the army of Algeria, including the troops in Alger and Oran, were sent to the hatching points. The Algerians submit to this requisition willingly and without complaint.—C. V. R.

THE NEW CATTLE-FLY OR HORN FLY.

Many notes have appeared in the papers during the last summer and the present summer concerning a new pest which is worrying cattle in Pennsylvania, New Jersey, Delaware, Maryland, and northern Virginia. It is a small fly half the size of a house fly, which settles in great numbers around the base of the horns and on other portions of the body where it can not be reached by either the tail or the head of the animal. It sucks a moderate amount of blood, reduces the condition of the cattle, and lessens the yield of milk by from one-third to one-half. It has been named by Dr. Williston *Hæmatobia cornicola*. We are investigating its Virginia and Maryland occurrences, and have succeeded in tracing its life history. We find that the fly lays its eggs, usually at night, in freshly dropped cow dung, and that for the development from the egg through the maggot stage to the perfect fly a space of only twelve days is necessary. This rapidity of reproduction accounts for the wonderful numbers in which these flies appear, and it follows with reasonable certainty that thoroughly liming the dung in places where the cattle preferably stand at night will kill off many larvæ and greatly lessen the numbers of the flies.

On large stock farms little else can be done, but applications may be made to milch cows and valuable animals which will keep the flies away. The applications may be (1) fish-oil and pine tar with a little sulphur added; (2) tobacco dust, when the skin is not broken; (3) tallow and a small amount of carbolic acid. The latter application will also have a healing effect where sores have formed.

We expect to publish a full and illustrated account of this insect at the close of the season.

U. S. DEPARTMENT OF AGRICULTURE.

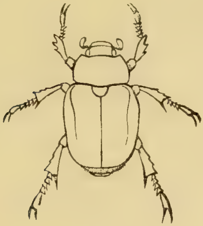
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. SEPTEMBER, 1889.

Vol. II. No. 3.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS,
ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE,
AND EDITED BY THE ENTOMOLOGIST
AND HIS ASSISTANTS.



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SPECIAL NOTES.

Insect Pests in East India.—We have just received through the kindness of Mr. E. C. Cotes, of the Indian Museum, Calcutta, a very interesting paper, entitled "Notes on Indian Insect Pests," which forms No. 1 of Vol. I of the "Indian Museum Notes," published by the trustees of the museum and by the authority of the revenue and agricultural department of the Government of India. This publication is to take the place of "Notes on Economic Entomology," of which two numbers have appeared. The present number is divided into three parts; the first part contains "Notes on Rhynchota," by Mr. E. T. Atkinson, and includes short articles upon the Rice Sapper (*Leptocorisa acuta*), an insect which considerably injures the autumn rice by settling upon it when it is milky and sucking out the juice, leaving the husk dry; as many as 6 to 10 of the insects have been seen upon a single ear; the Chora-poka (probably *Carbula biguttata*), an insect which appears in vast numbers when the sesamum crop is gathered and stacked on the threshing floor and eats out the kernel of the seed, leaving only the husk; the Green Bug (*Nezara viridula*), which occurs upon potato halms; also several species of *Capsidæ*, *Jassidæ*, *Aphidæ*, and *Coccidæ*. A new species of *Cerataphis* and a new species of *Pemphigus* are mentioned as feeding upon Cinchona. The second part is by Mr. L. de Nicéville, and treats of a Butterfly injurious to Rice and the Ceylon cardamom pest. The butterfly is *Saustus gremius*, and the larvæ feed upon the leaves of rice. The cardamom pest is *Lamphides elpis*, the larva of which bores circular holes into the capsules and destroys the contents. The damage done by this latter pest is sometimes as great as 80 to 90 per cent. to young plantations. Between from 5 to 10 per cent. of the fruit capsules are perforated.

In the third part Mr. E. C. Cotes gives us further notes on the Wheat and Rice Weevil, on the Sugar-cane Borer-moth (*Chilo saccharalis*), the Sorghum borer (species not determined), a caterpillar injurious to tea, cut-worms, a moth injuring a cultivated timber tree known as *Cedrela toona*, Clothes moths, *Hispa ænescens* injuring rice, a

species of *Tomicus* which bores in the Makai tree (*Shorea assamica*), a bamboo borer, the Leather Beetle (*Dermestes vulpinus*), which is mentioned as damaging silk-worm cocoons, further notes on insecticides, short notes on miscellaneous insect pests, and extracts from correspondence.

Among the short notes on miscellaneous insects we may mention as of especial interest the damage done by *Heliothis armigera* to the poppy crop in Patna and Arrah, the occurrence of a bag worm upon tea bushes, the damage done to the castor-oil plant by the larva of a noctuid moth known as *Achœa melicerte*, the damage done to jute crops by caterpillars, the *Spilarctia suffusa*, the injury by *Tinea lucidella* to the horns of hollow horned ruminants, damage to the leaf covering of opium balls by *Lasioderma testaceum*, a species which also injures manilla and Indian cheroots. Many other insect notes of considerable interest occur and many of them are accompanied by both their Indian names and particulars of the plants which they infest. The paper is illustrated by four very good plates reproduced by a photo-etching process.

The Lesser Migratory Locust.—Since the destructive year 1883, this insect has not done much damage in the interesting region of southern New Hampshire, which we wrote up at some length in the Annual Report of this Department for that year, but the present season has brought another outbreak, and in July we sent Mr. Marlatt, of this Division, into the field to look into the condition of affairs, to advise with the farmers concerning remedies, and to collect facts relating to the years intervening between the present date and 1883. We publish in this number his report of his short investigation, and this account will bring the history of locust damage in that locality down to the present time.

New Injury by the Leather Beetle.—Mr. F. M. Jones, of Wilmington, has called our attention to the damage done by this insect in many of the large establishments of that city to goat-skins used in the preparation of morocco leather. Mr. Jones has prepared a short article at our request, which we publish in this number.

The Official Association of Economic Entomologists.—We print under the head of general notes the constitution of this new organization, together with the lists of officers and charter members. The next meeting will soon be held, and we would urge all economic entomologists to read the constitution carefully, and, if they feel themselves in sympathy with the Association, to send their credentials and names to the secretary, Prof. J. B. Smith, at New Brunswick, N. J. That this asso-

ciation will have a successful future and that it will accomplish the results anticipated can hardly be doubted. The greatest enthusiasm was exhibited at the meeting, and every letter received carried with it the expression of warm approval.

DERMESTES VULPINUS IN GOAT-SKINS.

By Frank M. Jones, *Wilmington, Del.*

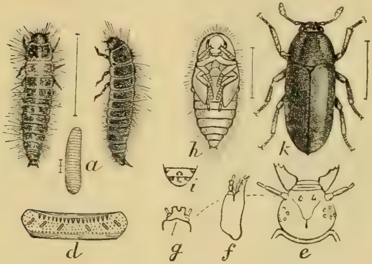

Fig. 7.—*Dermestes vulpinus:* *a*, egg; *b*, *c*, larva, lateral and dorsal view; *h*, pupa, ventral view; *k*, beetle—enlarged; *d*, dorsal view of one of the middle joints of larva denuded to show spines and tubercles; *i*, ventral view of tip of abdomen in ♂ beetle; *e*, head of larva; *f*, left maxilla of same, with palpus; *g*, labium of same, with palpi—enlarged. (After Riley.)

Mr. James Fletcher, in his address before the Entomological Society of Ontario, in October last, divided injurious insects into three classes—first, second, and third class pests—"according to the amount of injury they are answerable for"; and the insect under consideration, the leather beetle, *Dermestes vulpinus,* belongs to the second of these classes; for, while it is always to be found, throughout the summer months, in the baled goat-skins stored in the ware-rooms of the importers and morocco manufacturers in various parts of the country, it is only occasionally that it occurs in sufficient numbers to do any great amount of injury. The larvæ are usually most abundant upon the hair side of the skins, but an examination of skins which have been damaged by them proves that they often commence their attack on the flesh side. When they occur in large numbers, and when no attempt is made to check their ravages, the skins are quickly eaten into holes, rendering them almost worthless. The pupa is not inclosed in any cocoon, but lies loosely in the hair or in a fold in the skin; and it is a common sight to see larvæ of various ages, pupæ, and the perfect insects inhabiting the same skin.

Skins which are naturally of a greasy nature, such as the Kassan (from Russia) and the Angora skins, appear to be most liable to attack; and heavily-salted skins, such as the Mochas (Arabian), are compara-

tively free from the pest; but even the poison-cured skins are not entirely exempt. Tampico (Mexican) skins are sometimes very badly damaged by this insect, which must now be very widely distributed; for whether the skins come from Russia or Cape Town, Turkey or Mexico, Arabia or South America, the same species of insects is found in them all.

FIG. 8.—Goat-skin damaged by leather-beetle—nat. size. (Original.)

It is said that fifteen or twenty years ago this insect was much more injurious than now; but this is probably due to the fact that, the demand being much greater, the skins are used up much faster, and the insects do not have time to multiply to any great extent. The only method employed to destroy them is to beat or shake each skin separately and crush the insects which fall to the floor; but where there are thousands of skins this is a tedious process, and is probably only a temporary check, as many insects are undoubtedly left in the skins. Placing the bales in a close compartment and killing the insects by means of vapor of bisulphide of carbon, or by burning sulphur, has been proposed; but the practical value of these methods has not been tested.

THE JAPANESE PEACH FRUIT-WORM.

In the August (1888) number of Insect Life we published some correspondence between the Rev. W. J. Holland, who was then serving as naturalist to the U. S. *Eclipse* expedition, and the United States minister to Japan and the Commissioner of Agriculture, relative to the ravages of a worm which damages the peach crop of Japan. Those who read this correspondence will recollect that we suggested through Commissioner Colman that the matter be referred to Prof. C. Sasaki, of the Agricultural and Dendrological College at Tokio, and that Professor

Sasaki be directed to make a full report concerning this insect. It seems that this suggestion was adopted, and that Professor Sasaki was instructed by Count Okuma, the Japanese minister for foreign affairs, to prepare the report, which he did with his customary care. The report was submitted to the Secretary of Agriculture through the United States minister to Japan and the Secretary of State during July. Meantime we sent to Professor Sasaki for specimens of the insect, which have not yet arrived, but upon their receipt we shall reproduce some of his figures and give the insect a definite name, and shall publish his somewhat elaborate account in full. Meantime, however, the matter is of so much interest to the fruit-growers of the Pacific coast that we submit a short abstract.

The moth, according to Professor Sasaki (and judging from his figures he is correct) is a species of *Carpocapsa* very closely allied to our Codling Moth, and hence it is called by Professor Sasaki "a new Codling Moth injurious to the Peach." The peach crop is very large in Japan, and during some seasons more than 90 per cent. of the fruit is injured by this insect. Not infrequently more than one larva are found in a single peach. No means have been heretofore suggested for the protection of the crop. Professor Sasaki's studies were begun in April 1, 1888, and concluded in May, 1889. The moth appears twice in the year, viz, in June and in August, although certain individuals of the first brood are delayed until July and others of the second brood until September. They hide in the day-time and at twilight fly about the trees. The eggs are deposited singly on the apex of the fruit or along the suture passing from the apex toward the base. Usually one or two, but sometimes more, eggs are deposited in a single fruit. The eggs are spherical in form, measuring one-half millimeter in diameter. They are yellow in color. They hatch in a few days, and the larva molts four times. Upon first hatching it crawls actively about in search of a suitable spot at which to enter the fruit; it then gnaws its way in, turns its head towards the opening and closes it with silk, sometimes pushing its excrement outside. It then burrows to the stone and makes a large excavation around it. Occasionally a larva will leave one peach and enter another.

The fruit is continuously infested from June until September, those containing larvæ ripening early and dropping off. Infested fruit may be recognized in the following ways:

(1) It becomes soft and may be crushed by a slight pressure on account of the central excavation.

(2) It has usually a small cluster of yellowish-brown excrement on its surface.

(3) It bears irregular patches of a greyish-yellow or reddish-blue color.

The larva attains its full growth in from three to four weeks after hatching; it then leaves the fruit and falls to the ground, if the fruit has not already fallen.

The larva enters the ground to a depth of 1 or 2 inches, where it

makes an oval cocoon of light gray silk. The cocoon is very strong and elastic. The larva of the first brood remains within this cocoon about a week and then changes to pupa, while the larva of the second brood remains within the cocoon in the larval state through the winter and changes to pupa in the month of May.

Professor Sasaki makes but one suggestion as to remedies, and that is to gather the fallen fruit every day and to dispose of it in such a way as to destroy the larva. We have already written him that he will unquestionably find a good remedy in the application of arsenical poisons for the first brood.

A REPORT ON THE LESSER MIGRATORY LOCUST.

By C. L. Marlatt, *Assistant.*

The following account of the recurrence in injurious numbers of the Lesser Locust (*Melanopus atlanis*) the present season in the Merrimac Valley near Franklin, N. H., may be considered as supplementary to the extended article in the report of the United States Entomologist for 1883, in which a full record of the earlier occurrence of this species in northern New England (1743–1883) is given; its life-history and habits, natural enemies, and means against it.

As stated in the article cited, Professor Riley visited the infested region in person in 1882 and 1883, and with the aid of some of his assistants introduced and explained to the farmers some of the machines for collecting and destroying the locusts successfully used against the closely allied but more destructive Rocky Mountain species.

The value of these appliances was immediately recognized by the intelligent farmers of the Merrimac Valley, and numbers of them were constructed after the pattern of the one described on p. 176 of the report for 1883 and figured Pl. VII, 1; and with the incentive of a bounty of $1 per bushel, granted by the State, they were used with such effect against the locusts in the two years following (1884 and 1885) that no serious injury has, previous to the present season, been occasioned by them since 1880.

To illustrate the success which attended their use, the statement of Mr. George B. Mathews may be given, viz, that no less than 500 bushels were caught at the Webster place in 1884, a much less number in 1885, since which time they have occurred in but small numbers.

A letter to the entomologist from Mr. E. A. Fellows, July 3, 1889, quoted below, again called attention to a serious outbreak of locusts in the Merrimac Valley, near Franklin, N. H., and but a few miles above the region unusually infested in 1882 and 1883, and seemed to warrant the investigation recorded in this article.

To the ENTOMOLOGIST:

DEAR SIR: My farm this season is infested with grasshoppers, the hay, oat, and rye, and part of vegetable crop being nearly a complete failure. I find on many of the grasshoppers a small parasite or egg of a deep orange-red color, clinging to different parts of the locust's body, being mostly on and under the wings. What I would like to know is, whether this parasite is likely to check the increase of the locusts another season, as it don't pay for me to plant crops to be devoured by these ravenous locusts. I have caught some sixty bushels from one piece of oats, containing 3½ acres, but am satisfied I can never exterminate them that way. They were quite bad last season, but not to be compared to this.

Respectfully,

E. A. FELLOWS.

FRANKLIN, N. H., *July* 3, 1889.

Mr. Fellows's communication is interesting not only because it records the abundance of the Locust Mite (*Trombidium*), previously found here in but limited numbers, but as still further emphasizing the peculiar local habit of *Atlanis* in this region, noted in the report already cited.

Mr. Fellows's farm, which was visited July 11, is situated in an "intervale" or small valley of about 300 acres, shut in by high hills, and thus separated from similar intervales above and below.

In these small intervales the locusts find a permanent home, only occasionally assuming the migratory tendency; and under favorable circum stances, especially if left unchecked, they after a year or two become suddenly numerous enough to do great injury, while at the same time in the similar valleys above and below their numbers may be significant only of future increase.

This state of things is well illustrated on the Fellows farm the present year. These locusts, always present in small numbers, had last year become quite abundant, and as no measures were taken against them, they this spring appeared in destructive hordes. The grasses suffered most. Timothy, red-top, chess, and clover were reduced to mere innutritive stalks; both blades and the heads of the oats were eaten; all garden vegetables were attacked. Squashes, melons, and corn were only eaten when very young. The tassel of the latter, however, is also eaten by the locusts.

At the time of examination the locusts were generally winged, and while still quite thick in the oats had scattered somewhat over adjoining meadow-land, and were especially abundant near the river, which had perhaps, by forming a barrier to their half-migratory movements going on at this time, caused them to collect there. A small percentage (5 to 10) were *in coitu;* but none were found ovipositing, although in the dissection of a large number of females one or two were found with empty ovaries, indicating that oviposition had already begun.

Examination of the ground, and, as observed by Mr. Fellows, the first appearance of the young locusts in the spring agree in indicating that the eggs are deposited more particularly in certain sandy knolls in the interval, and perhaps to a certain extent on the lower portion of the bordering hill-sides.

If this be the case, the destruction of the eggs by harrowing or plow-

ing in the fall, or of the young locusts in the spring either by plowing them under or by the use of trapping or kerosene machines, should be comparatively easy.

The parasite mentioned by Mr. Fellows, the young of the locust mite (*Trombidium locustarum* Riley), was very common, but on the authority of Mr. Fellows was becoming rapidly less abundant. He stated that during the active operations with the hopper-doser the "catch" was markedly colored by them, and that he had observed this spring on his land unusual numbers of a red spider-like mite, which, from his description, was undoubtedly the adult of the locust mite.

A considerable variation in the percentage of infested locusts in different parts of the intervale was noted, and this holds also for the parasites mentioned below.

On the oat-field, fully 95 per cent. of the locusts bore from one to fifty mites, while of those near the river less than 50 per cent. were infested, a fact easily explained perhaps by the greater activity of the non-infested locusts.

Large numbers of dead locusts, mostly hollowed out and reduced to mere shells, were observed over the infested tract on the ground or clinging to grass or oat stems. Some of the fresher specimens contained Dipterous larvæ (*Tachina* and *Sarcophoga*), and examinations of living locusts taken from the oat field showed that about 5 per cent. were thus parasitized, each parasitized locust containing from one to four maggots.

A slightly larger percentage proved to be infested with hair worms (*Mermis*). The abundance of these parasitic enemies the present year would indicate a very considerable reduction in the next year's crop of locusts; but this should not form an excuse for neglecting any direct measures that can be employed against the eggs this fall, or early work against the young should they appear in numbers next spring.

Mr. Fellows's operations against the locusts, which were confined to the use of the collecting pan mentioned above after the locusts had become mostly winged and the damage largely accomplished, while unsatisfactory to himself would have doubtless been much more effective if undertaken earlier, or if measures had been taken against the early stages.

In all seventy-two bushels were caught and buried in a trench during a period of about two weeks in the latter part of June and the first of July. Of these, sixty bushels were taken from the three and a half acres of oats into which the locusts migrated from adjacent fields during this time.

In place of the kerosene and water or kerosene emulsion ordinarily used in these pans, Mr. Fellows employed a strong soap-suds, which assisted in retaining the locusts in the pans.

Locusts were reported to be moderately abundant above Franklin, at Hill, and also below, near North Boscawen, at the Webster place. On the farm of Mr. Wright, near Hill, they had practically destroyed several

acres of grass and were at the time of examination working in the oats. Mr. Wright stated that the locust had not been previously very abundant there since 1884 and 1885, when a number of bushels had been caught.

A number of farms in the neighborhood of the Webster place were also examined, and the farms of Mr. Gordon Burleigh and Mr. Benjamin Hancock were found to be somewhat thickly stocked with locusts, and the grass had been considerably injured.

Mr. Geo. B. Mathews, of the same place, a very intelligent farmer, assured me that the locusts could be easily controlled, and that he was not troubled at all except as they drifted onto his land from the farms adjoining. He had used the "hopperdoser" with good success in 1884 and 1885, and since then, by carefully noticing the breeding ground of the locusts and plowing the young under in the spring, he had succeeded in reducing their numbers to a minimum, with very little loss to himself. He was of the opinion that an officer empowered to compel the plowing of the infested fields at the proper time, with perhaps a compensation to the farmer for the crop turned under, would be the only practical solution of the locust trouble.

While investigating the locusts about Franklin, reports came to me of the serious depredations of this pest on the Connecticut River, near Bellows Falls, Vt., and at the direction of the Secretary of Agriculture this locality was visited and the following data collected.

The occurrence of the locusts here is especially noteworthy because it illustrates most pointedly the local habits of *Atlanis* already described.

In answer to inquiries made at various points from Hanover to Bellows Falls, I was informed by various parties and particularly by Professor Whicher, Director of the New Hampshire Experiment Station, at Hanover, that the locusts were not known to be abundant elsewhere on the river.

The infested area proved to be an intervale of about 500 acres extent, similar to those of the Merrimac Valley, and contained the farms of Mr. Marvin W. Davis, member of the State Board of Agriculture, and of Mr. R. H. Blair. Both of these gentlemen were seen, and to the former, on whose farm the locusts were especially abundant, I am indebted in part for the following facts:

The locusts were first noticed in this valley some fifteen years since, when they ruined the tobacco crop by eating the leaves of the young plants full of holes. Their attacks at that time and afterwards were so severe that the growth of this crop was abandoned. The locusts have increased from year to year, and the present has witnessed them more abundantly than ever before; the fences and roads being reported as black with them as they moved from the hatching-grounds to other fields.

Grasses and oats, young corn and garden vegetables, even the onions, were eaten.

The statements of these farmers, confirmed by my own observations, show that the eggs are deposited, in great part, in a sandy-clay knoll thinly clothed with grass and of but few acres area, from which the locusts migrate to all parts of the valley.

No effort has been made here to control the locusts except an ineffectual attempt to use a large flock of turkies for this purpose, but it would seem, in view of the limited area in which eggs are placed, to be a comparatively easy matter to keep them in subjection by the use of the measures already given.

The Locust Mite, Dipterous larvæ, and Hair-worms were found to infest the locust here in somewhat less numbers than at Franklin.

THE IMPORTED AUSTRALIAN LADY-BIRD.

Vedolia cardinalis.

By D. W. Coquillett, *Los Angeles, Cal.*

In his annual report for the year 1888, published in the report of this Department for that year, Professor Riley has given an account of "The Importation of Parasites and Predaceous Insects from Australia," containing an account of the importation by the Department of certain kinds of insects which naturally prey upon the Fluted or Cottony-cushion Scale (*Icerya purchasi*, Maskell). At the time of writing the above report only a few specimens of the black and red Lady-bird had been received, so that very little could be said in regard to its habits and early stages. As I have now carefully worked them out, I give herewith a brief account of them, in accordance with directions from the Division of Entomology.

EARLY STAGES.

Egg.—Elongate-ovate, or rarely elongate ellipsoidal, its width never more than one-half its length; very rough, or scabrous; deep orange-red; length, one-half millimeter.

Larva (*first stage*).—Dark orange-red; first segment with two small black warts placed subdorsally, and with two long whitish bristles on each side; segments two to eleven each, with three dark-brown warts each side—those on segments two and three situated in the subdorsal, supra-stigmatal, and stigmatal regions, while those on the remaining segments are situated in the dorsal, supra-stigmatal, and stigmatal regions; each of those in the stigmatal region bears two long whitish bristles, while each of the others bears a single shorter whitish bristle, those on the eleventh segment the longest; head about five-sixths as wide as the first segment and slightly darker, its sides blackish; six thoracic legs orange-red, the tibiæ darker; last segment furnished with a retractile proleg.

Second stage.—Same as in the first, with these exceptions: Head about three-fifths as wide as the first segment; this segment bears two additional bristles near each corner, and two others in front of the middle; second and third segments each with an additional but much smaller wart in front of those in the stigmatal region, each bearing a single short bristle; bristles, except those in the stigmatal region, black, the warts in this region reddish, and larger than the others.

Third stage.—Same as in the second, except that the head is proportionately narrower, being only about one-half as wide as the first segment.

Fourth stage.—Same as in the third, except that the warts in the subdorsal and supra-stigmatal region on either side of the third, and usually of the second segment, are connected by a black spot, and the body finally becomes covered over with a light gray powder; length when fully grown, about 6 millimeters (Fig. 9).

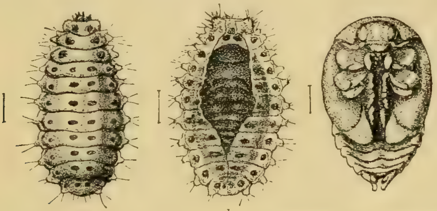

FIG. 9.—*Vedolia cardinalis*: *a*, Full-grown larva; *b*, pupa, dorsal view, enclosed in last larval skin; *c*, pupa, naked, ventral view—all enlarged. (Original.)

PUPA.—Partially inclosed in the old larval skin, which is of a whitish color, marked with black dots, which indicate the position of the warts on the larva as described above; this skin is rent from near the front edge of the first segment to the middle of the eighth; the exposed part is mottled light and brownish red, the first segment marked with two dorsal black dots, or the entire dorsum of this segment, and also that of the second and third segments, black; abdomen with a polished-black interrupted dorsal line; length, 4 millimeters (Fig. 9).

The following table exhibits the length of time passed by these Ladybirds in their different stages:

Egg laid.	Egg hatched.	First molt.	Second molt.	Third molt.	Pupated.	Beetle issued.
Apr. 20	Apr. 26	May 3	May 5	(?)	May 14	May 21
Apr. 23	Apr. 29	May 3	May 7	May 15	May 19	May 26
	Apr. 27	May 3	May 5	May 11	May 19	May 26
	May 6	May 11	May 14	May 19	May 29	June 5
		May 11	May 13	May 17	May 23	May 31
			May 9	May 12	May 20	May 26
			May 17	May 22	May 31	June 5
				May 10	May 17	May 25
				May 11	May 19	May 27
				May 12	May 19	May 26
					Apr. 25	May 4
					Dec. 5	Dec. 18

Averages: *Egg*, six days. *Larva*, nearly twenty-two days (*i. e.*, first stage, five and a half days; second stage, two and three-fifths days; third stage, five and one-sixth days; fourth stage, seven and five-ninths days). *Pupa*, seven and three-fourths days. Egg to beetle, a little over thirty-five days.

Three of the beetles which issued from the pupa May 4 were kept in a breeding cage in a sunny window of my office and supplied with an abundance of food; one of them died on the 20th of May, another on the 26th, and the third died on the 5th of June. It is probable, therefore, that in the open air in summer the beetles live about four weeks after issuing from the pupa, so that their existence from the time the egg is laid until the adult which originated from it dies a natural death covers a period of about two months. During the colder portion of the year, however, this period is doubtless extended considerably beyond this limit, as will be seen by reference to the above table; for instance, the larva that pupated December 5 was changed to a beetle thirteen days later, whereas the one that pupated May 31 produced the beetle five days later.

HABITS AND NATURAL HISTORY.

The eggs are usually thrust beneath the Iceryas, but are sometimes attached to the cottony egg-masses; they are placed on one of their sides, sometimes singly but usually in pairs or in groups of three or more. In hatching, the egg-shell is rent nearly the entire length along its upper side, and after the young larva has issued the shell becomes of a whitish color, and retains nearly its original form. The recently laid egg is more slender and of a deeper red color than the egg of the Icerya.

The young larvæ usually burrow into the egg-masses from below and feed upon the eggs; later they attack the Iceryas of all sizes, usually making the attack on the under side of the abdomen. The young larva is easily distinguished from the young Iceryas by lacking the long black antennæ so conspicuous in the latter. When about to cast its skin the larva attaches the posterior end of its body to some object, and at the proper moment breaks away the whole anterior end of the old skin and crawls out of the opening thus made.

When about to pupate the larva attaches the posterior end of its body to the bark or leaf of the tree and suspends itself head downward. It remains in this position about three days, when the skin along its back splits open, exposing a portion of the pupa to view. When the beetle is fully formed the old pupa-skin partially breaks away, showing the beetle to be of a pale reddish color. It remains in this situation about two days longer, when the beetle issues clad in its normal colors of black and red, as shown in the figure (Fig. 10). Coition occurs shortly afterward. In fact I have frequently seen the males standing by and wait-

ing for the females to issue, even going so far as to tear away the old pupa-skin and uniting with the female while she is still soft and helpless. Egg laying begins the next day, and is continued during nearly the entire life of the beetle. One that I kept in a breeding-cage and supplied with an abundance of food, deposited 42 eggs in eight days. The total number deposited by one female will probably average from 150 to 200 eggs.

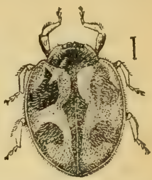

FIG. 10.—*Vedolia cardinalis*, adult; enlarged. (After Riley).

The adult beetles as well as the larvæ also feed upon the Iceryas, but with this difference, that the attack is usually made from above instead of from below.

I have never seen these Lady-birds in any of their stages feeding upon any other insect than the Icerya. On one occasion I confined six Lady-bird larvæ in a breeding-cage containing black scales (*Lecanium oleæ* Bernard), some of which were quite soft, but after the lapse of seven days none of these scales had been attacked, whereas three of the Lady-bird larvæ had been devoured by their comrades. At the same date I placed an equal number of these larvæ in another cage containing specimens of an undetermined species of *Lecanium* found on a peach-tree, several of the scales being still soft, but at the end of seven days none of them had been attacked, while four of the Lady-bird larvæ had fallen a prey to their rapacious brothers. I also tested these larvæ with a species of plant-louse found on orange-trees, but they did not attack them. It seems very evident, therefore, that the Iceryas are the natural food of these Lady-birds, and they feed upon these in all their stages, even attacking the winged males.

I have never seen any of our native insects attacking these Lady-birds, although Col. J. R. Dobbins informs me that on one occasion he saw a lace-winged fly larva (*Chrysopa* sp.?) in such a position that he thought it might have been engaged in feeding upon a Lady-bird larva. The ants do not molest them.

IMPORTATION AND SPREAD.

The first consignment of these Lady-birds reached me on the 30th of November, and numbered twenty-eight specimens; the second consignment of forty-four specimens arrived December 29; and the third consignment of fifty-seven specimens reached me January 24, making one hundred and twenty-nine specimens in all. These, as received, were placed under a tent on an Icerya-infested orange-tree, kindly placed at my disposal by Mr. J. W. Wolfskill, of this city. Here they were allowed to breed unmolested, and early in April it was found that nearly all of the Iceryas on the inclosed tree had been destroyed by these voracious Lady-birds. Accordingly, on the 12th of April, one side of the tent was removed, and the Lady-birds were permitted to spread to

the adjoining trees. At this date I began sending out colonies to various parts of the State, and in this work have been greatly aided by Mr. Wolfskill and his foreman, Mr. Alexander Craw, both of whom were well acquainted with the condition of the orchards in this part of the State. By the 12th of June we had thus sent out 10,555 of these Lady-birds, distributing them to two hundred and eight different orchardists; and in nearly every instance the colonizing of these Lady-birds on Icerya-infested trees in the open air proved successful. The orange and other trees—about seventy-five in number—and also the shrubs and plants growing in Mr. Wolfskill's yard, have been practically cleared of Iceryas by these Lady-birds, and the latter have of their own accord spread to the adjoining trees to a distance of fully three-fourths of a mile from the original tree.

Besides the three consignments of these Lady-birds referred to above I also received two later consignments. The first of these reached me February 21, and numbered thirty-five specimens; these I colonized on an Icerya-infested orange-tree in the large orange grove belonging to Colonel J. R. Dobbins, of San Gabriel. The last consignment of three hundred and fifty specimens arrived March 20; one-third of these I left with Colonel Dobbins, while the remainder I colonized on orange-trees in the extensive grove owned by Messrs. A. B. and A. Scott Chapman, in the San Gabriel Valley. All of these colonies have thrived exceedingly well. During a recent visit to each of these groves I found the Lady-birds on trees fully one-eighth of a mile from those on which the original colonies were placed, having thus distributed themselves of their own accord. The trees I colonized them on in the grove of Colonel Dobbins were quite large and were very thickly infested with the Iceryas, but at the time of my recent visit scarcely a living Icerya could be found on these and on several of the adjacent trees, while the dead and dry bodies of the Iceryas still clinging to the trees by their beaks, indicated how thickly the trees had been infested with these pests, and how thoroughly the industrious Lady-birds had done their work.

EXTRACTS FROM CORRESPONDENCE.

Enemies of Diabrotica.

With this I mail you a spider which I found with a *Diabrotica soror* in his jaws. Will you please send me the name of this spider, as also of the family to which it belongs? If new, would it not be well to describe it, or to have Dr. Marx do so if he will?

It may interest you to know that I have bred a Tachina fly from *D. soror*, but its wings never expanded, so it is not fit for study. I have just captured a large number of these beetles, and will try to breed perfect specimens of this fly.—[D. W. Coquillett, Los Angeles, Cal., June 19, 1889.

REPLY.—The spider which you found eating Diabrotica is *Xysticus gulosus* Keyserling. It belongs to the family Thomisidæ. Your note concerning the breeding of the Tachinid from the Diabrotica is very interesting.—[July 3, 1889.]

The New Zealand Latrodectus.

I take great interest in reading the periodical bulletin on "INSECT LIFE." In Vol. I, No. 7, January, 1889, I read an account of the spider called *L. mactans*, the description of which tallies with a spider I used frequently to see in New Zealand, North Island. I see that in your bulletin it is described as black with vermilion spot on abdomen. During my stay in the above country I saw many of these spiders, some black with a red *triangular* spot on back and some black with a yellow spot on back of same shape. Whether these are of the same species I am unable to say, but they frequented the same places, mostly banks of rivers, and were especially numerous on the banks of the Wanganui River. The Maoris told me that their bite was not fatal, but very painful. I knew of a case where a Maori was carrying wood from the river to his "whare", situated on the banks. He got bitten by one of these spotted spiders that was concealed in the wood—was bitten in the hand—and during the night the arm was paralyzed to the shoulder. Whisky applied externally and internally effected a cure. It is said that the pain is felt for weeks after, with perhaps a month or so of no pain between. I have mentioned these facts because I did not see in your bulletin any account of a *yellow* spotted *L. mactans*.—[C. Herberte Riley, Gabriella, Fla., April 27, 1889.

Chinch Bug Remedies.

In complying with your request, I will state that as early in the spring as the warmth of the season will permit the Chinch Bugs come out of their winter quarters and resort to their natural place of ravages, the wheat fields. They first gather in groups and burrow into the soil among the roots of the wheat, clearing the soil from around them and leaving a top crust. There they cohabit, and from the 1st to the 15th of May deposit their eggs by thousands on the roots of the wheat. They have previously cleaned the soil from the roots for that purpose. As soon as the sun shines hot enough to warm the ground sufficiently, the eggs hatch and the young bugs begin to suck at the roots of the wheat. As they grow and become older they crawl up to the top of the soil and up the stalks of wheat, and still suck as long as there is any life or sap in the stalks, when they begin to travel to other parts of the field for a new supply. All go in the same direction. The old bugs injure the wheat only by clearing the soil from the roots. As soon as they get through depositing their eggs they die. To evade their ravages I leave my wheat ground with as smooth a surface as possible in the fall. Then in the spring, as soon as winter is over, I put a heavy roller on my wheat ground, pack the soil firmly to the roots of the wheat, and thereby prevent the old bugs from burrowing about them. Besides, this gives the wheat an early, vigorous growth, and thus the bug is overcome, so far as its ravages in the wheat field are concerned. I sometimes roll my ground the second time, say, about the 15th of April or the 1st of May, or later. It depends upon how the bugs are progressing, which can be told by drawing the wheat and examining the roots for eggs. I never fail to make good wheat. Besides, the crop of bugs is so diminished that they never injure my other grain crops or grasses to any serious extent. My neighbors failed to make wheat in 1888, while I harvested a heavy crop. I knew one man who gave his crop of wheat (15 acres) to one hundred sheep in the month of April and turned them off the 1st of May. His wheat came out and made good grain, while all around him failed on account of the Chinch Bugs. The sheep packed the soil to the roots, and thus overcame the bugs. I hope that others will try the experiment, as I have done, and be convinced that the ravages of the bugs can be overcome.—[J. R. Adams, Goodland Mo. June 29, 1889.

Cut-worms.

The Cut-worms are very bad in this section. I am putting out quite a patch of sweet potato plants. I sprout largely for sale and for my own use, and also raise

cabbage, tomato, pepper, and other plants. I find that the Cut-worms are working on most all of them. I have been making green clover traps and collecting them under the bunches of clover, then burning them under these and in the ground beneath. I have found as many as 64 worms under one bunch that we had placed between the ridges of sweet potatoes. I first soaked the green clover in Paris green, but I think I did not get it strong enough, as I found only a few dead ones under the traps. Pie-plant or rhubarb leaves are also good. They may be put under the half of a large drain tile split in two, and the south end stopped up with dirt so as to keep the leaves from drying out. The worms may then be hunted every day under the leaves and killed. Cabbage and turnip leaves are also good. Can you give me any other information on this subject? I have concluded now to try soaking the plants in a solution or tea made of red pepper just at setting them in the ground. I make it by boiling the pepper in soft water and then letting it get cold, when the plants may be dipped into it. In my next experiment I will try common kerosene (coal-oil) with soft water well agitated, and set the plants out immediately after dipping them in it.—[A. L. Thompson, Homer, Ill., May 20, 1889.

REPLY.— * * * The remedy which you have applied, viz, the poisoned clover, was first suggested in 1882 by Professor Riley, and was first experimented with so far as we know by Dr. A. Œmler, of Wilmington Island, near Savannah, Ga., who found it exceedingly successful, and who was enabled to almost entirely rid his land of Cut-worms. In our opinion you will find it a much better means of fighting the worms than either of the other remedies which you mention, and we would advise the greatest care in the trial of a kerosene remedy, lest the plants should be killed. It will be well in fact to emulsify the kerosene with soap and water and then dilute it considerably before dipping the young plants in it. Even then success can not be relied upon. * * * —[May 23, 1889.]

An Army-Worm Note from Indiana.

I recently had my first experience with the Army-Worms, which were discovered June 17 in a piece of rye growing on reclaimed swamp land commonly called "muck." We confined them to the rye, which they soon cleaned up. The piece contained about nine acres, and at one time, or when the worms were nearly developed, and about one and one-half inches long, as much as five acres were literally covered with them. An open ditch on one side, filled with swift-running water and ditching and pitting on another, turned them into a wood pasture of blue-grass, where I called in about 150 hogs, old and young, that quickly devoured those already in and all that came after. But I also began plowing under the rye stalks and stubble by encircling the whole piece, and they could not well travel across plowed land, so those confined within the circle became lank and lean soon after, but on about June 25 they disappeared somewhat suddenly, but how I do not know. Now, I would like to have some information as to the nature of the Army-Worm and the facts as to their origin in such immense quantities. If they had been propagating year by year along the fences and by-places adjacent to this field, which had been previously for four successive seasons cultivated in potatoes, no injury came from them and none were noticed about the field. The previous seasons were very dry and last winter was mild, with little freezing and scarcely any rain, and just suited the insect fraternity. Or might the fly have come in vast numbers during the very warm days of April from a southern region and deposited their eggs in the rank growth of rye growing in a loose porous soil that was laden with vapor like matter that may have been attractive to the fly? Scores of acres in rye in this vicinity, growing on the same kind of soils, were destroyed in the same manner, although the farms and fields were not contiguous to each other. No other crop was attacked or injured. A good deal of theory and speculation has been discussed by the Granger brethren hereabouts as to their origin, nature, disappearance, and re-appearance. I have no complete works on entomology and can get no clear idea of their history. Chambers's Encyclopedia, which I have, says but little and nothing

definite, though it says "they (the worms) go into the molting stage and re-appear again the same season, or produce two crops in the same season similar to the cotton-seed boll-worm of the South, which produces three crops in one season." A definite answer as to their origin and history will be thankfully received by myself and others. —[I. M. Miller, Upland, Ind., July 16, 1889.

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX, WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord Walsingham.

[*Continued from page* 54 *of Vol. II.*]

Lithocolletis alnifoliella Hb.

Chamb. Bull. U. S. G. G. Surv., IV, 121 (1878).
Pack. U. S. Dept. Intr., Ent. Com. Bull. VII, 140 (1881).

This species was not included in the Index by Chambers, but in the List of Food-plants of Tineina (which was quoted by Packard in his List of Insects Injurious to Forest and Shade Trees) it is referred to as making a tentiform mine on the under side of the leaves of alder. For the present, at least, there is no evidence to justify its inclusion in the North American fauna.

Lithocolletis quercipulchella.

Chamb. Bull. U. S. G. G. Surv., IV, 120 (1878).
Pack. U. S. Dept. Intr., Ent. Com. Bull. VII, 53 (1881).

Packard is again only quoting from Chambers' List of Food-plants, where this species is referred to as feeding on the under side of oak-leaves. Chambers was acquainted with the larva of *quercibella*, which has a similar habit, but he omits this insect from his list of larvæ. In the Index he makes no reference to *quercipulchella*. There is, I think, no doubt that *quercipulchella* is a manuscript name for the species which he described as *quercibella*.

Lithocolletis lysimachiæella.

Chamb. Cin. Qr. Jr. Sc. II, 100 (1875): Bull. U. S. G. G. Surv. IV, 116, 154. (1878).

This name was given to a larva mining *Lysimachia lannelata*, but until the perfect insect has been reared I can not feel justified in including it as a species in the revised Index.

The practice of publishing names for insects which are known *only* in the larval state is much to be deprecated. The following facts speak for themselves and will explain why these references will not be given in the revised Index.

Coleoptera.

Gn. ? *sp.* ? mining *Quercus alba*. Chamb. Can. Ent. IV, 123–4 (1872).
  = *Lithocolletis tubiferella*. Chamb. Can. Ent. III, 165–6 (1871): IV, 123–4 (1872).
Gn. ? sp. ? mining *Quercus ilicifolia ?* Chamb. Can. Ent. IV, 124 (1872).
  = *Lithocolletis sp. ?* Chamb. Can. Ent. III, 166 (1871): IV, 124 (1872).
Gn. ? sp. ? mining leaves of "Willow Oaks." Chamb. Can. Ent. (1872): IV, 124 (1872).
  = *Lithocolletis* sp. ? Chamb. Can. Ent. III, 166 (1871): IV, 124 (1872).
Brachys æruginosa Say. Mining *Fagus ferruginea*. Chamb. Can. Ent. IV, 124 (1872).
  = *Lithocolletis* sp. ? Chamb. Can. Ent. III, 166 (1871): IV, 124 (1872).

Gn.? sp.? mining *Acer saccharinum.* Chamb. Can. Ent. IV, 124 (1872).
= *Lithocolletis* sp.? Chamb. Can. Ent. III, 166 (1871): IV, 124 (1872).
Metonius lævigatus Say. Mining *Desmodium.* Chamb. Can. Ent. IV, 124 (1872).
= *Leucanthiza?* sp. Chamb. Can. Ent. III, 166 (1871): IV, 124 (1872).

Lithocolletis chambersella.

= *quinquenotella* Chamb.

Chambers describes a species of this genus as *quinquenotella,* this name being preoccupied by a European species. I would suggest the name of *chambersella* to replace it.

Lithocolletis umbellulariæ sp. n.

Antennæ, white, evenly dotted with brown along their upper sides, the five brown spots towards the apex being larger and more widely separated than the others.

Palpi, shining white.

Head, face shining white, frontal tuft yellowish in the middle, saffron-brown at the sides.

Thorax, golden saffron, whitish behind.

Fore wings, golden saffron, somewhat shining, a short white patch at the base of the dorsal margin reaches to the fold and is exteriorly dark margined; the dark margin, of a somewhat similar white spot on the costal portion of the wing, also reaches to the opposite side of the fold a little beyond it; at one-fourth of the wing-length is a waved white fascia running nearly straight from the dorsal margin to the fold and bulging outwards beneath the costa; this is distinctly dark-margined externally throughout and briefly so internally; immediately adjoining the costal margin at half the wing-length is a broad, very oblique white costal streak dark-margined on both sides and freely dusted with blackish scales around the apex; the black dusting is continued along the outer side of an opposite less oblique dorsal streak, the apex of which reaches as far as the edge of the costal streak; above it, at three-fourths the wing-length, is a white costal spot slightly margined with blackish atoms, and opposite to this is another white dorsal streak, very oblique, externally margined at the apex with dusky atoms, which are continued so as to form a large patch of black dusting at the apex of the wing, on the upper side of which patch lies a sickle-shaped white costal streak, concave towards the costal margin; cilia pale saffron, with a brown line running through the middle and reaching around the apex nearly to the anal angle, where they become paler, inclining to grayish.

Hind wings and cilia, pale grayish.

Abdomen, dark gray above, grayish-white beneath; anal tuft, yellowish.

Hind tibiæ, white, with two broadish black bars across their upper sides and a small black terminal spot.

Exp. al., 9^{mm}.

Type, ♂ ♀ *Mus. Wlsm.*

Mendocino County, Cal., found and bred in the month of June, 1871. Three specimens, from large diffused blister-like mines on the upper side of leaves of *Umbellularia californica* Nuttal; the pupa being inclosed in a semi-transparent flat oval silken web within the mine, like that of *cincinnatiella* Chamb., to which species it is somewhat allied. Its nearest ally in America is probably *macrocarpella* F. and B., but it differs in the possession of a dark-margined costa-basal spot and in the comparatively straight first fascia.

These characters also serve to separate it from *cincinnatiella* Chamb. I think it is open to question whether *cincinnatiella* may not be a form of *macrocarpella.* The only differences I can detect in comparing authenticated specimens of each species are the somewhat larger size of *macrocarpella* and the less shining appearance of the ground-color of the wing; moreover, the white streaks appear to be duller and per-

haps somewhat more oblique, their dark bordering being more marked towards the costal margin than in *cincinnatiella.* At the same time the differences are very slight, and those who have an opportunity of collecting larvæ of the oak-feeding species would do well to study the subject.

Lithocolletis gaultheriella sp. n.

Antennæ, closely annulated with white and brown, the brown annulations somewhat wider apart towards the apex.

Palpi, silvery white, with a small spot on the outer side.

Head, face silvery white; frontal tuft saffron mixed with white.

Thorax, golden-saffron, posteriorly whitish.

Fore-wings, golden-saffron, shading to golden-brown, no basal streak, three costal and three dorsal snow-white spots, the first two pairs internally dark-margined; the first costal spot is situated at about one-third the length of the wing, its internal dark margin passing around its apex; the corresponding dorsal spot commences nearer the base of the wing and sometimes reaches obliquely to, or near, the point of the costal spot; the second costal spot at half the wing-length is somewhat oblique, square ended, and as in the case of the first is placed somewhat beyond its smaller corresponding dorsal spot, which is pointed and has some dark fuscous scales running outwardly from its apex and merging in the darkened lower margin of the costal spot above it; the third costal spot at one-fourth from the apex is somewhat triangular and lies also farther from the base than the corresponding smaller spot on the dorsal margin; before the anal angle, between these spots, lies a cloud of fuscous scaling serving to throw up and make more conspicuous these white markings on the golden-brown ground-color of the wing; inclosing the apex of the wing is a narrow, outwardly concave white streak, not reaching through the cilia on the apical but only on the costal margin; beyond it are a few darkened scales and sometimes one or two whitish ones with them; cilia pale, golden-saffron, tending to golden; gray about the anal angle. The only conspicuous markings on the under side are two pale spots in the costal fringes, corresponding with the last two markings on the upper side.

Hind-wings, grayish, with golden-gray cilia.

Abdomen, gray, anal tuft slightly paler.

Hind-tarsi, grayish-white, with one or two darker bands above.

Exp. al., 10-11^{mm}.

Type ♂ ♀ Mus. Wlsm.

A single ♂ bred from mines on the upper side of *Gaultheria shallon,* found at Rouge River, Oregon, in May, and bred June, 1872. Three others taken in Mendocino County in May and June, and a single specimen also taken near Crescent City, Del Norte County, Cal. It is one of the largest species of *Lithocolletis.*

Lithocolletis ledella sp. n.

Antennæ, whitish, faintly barred above with brown.

Palpi, white.

Head, face white, frontal tuft saffron, mixed with whitish.

Thorax, golden-saffron with a few white scales.

Fore-wings, golden-saffron with a white medio-basal streak, somewhat expanding outwards on the fold and reaching to one-third the length of the wing above it, this is dark-margined on its upper edge; beyond it are four costal and four dorsal silvery-white streaks; the first dorsal commences beneath the point of the basal streak and extends obliquely outwards to the middle of the wing, it is dark-margined internally and around its apex; the costal streak above it is short, rather square, and also internally dark-margined; the second costal streak,

scarcely longer than the first, is a little oblique and also inwardly dark-margined; beyond this are two more narrow costal streaks, the first curved outwards and dark-margined internally, the second pointing inwards from above the apex, with a few black scales at the extremity; the second dorsal streak is triangular, dark-margined internally and around the apex, commencing somewhat further from the base than the second costal streak, its point lies between the second and third; the two last of the four dorsal streaks are very slender and pointing inwards, with a few black scales at their ends; where they reach the points of the costal streaks above them a black elongate spot lies at the apex, separated from the dark apical line which lies at the base of the golden-gray apical cilia.

Hind-wings and cilia, gray, with a faint golden sheen.

Abdomen, gray, anal tuft paler.

Hind-tarsi, whitish-gray, unspotted.

Exp. al. 9–10mm.

Type ♂ ♀ *Mus. Wlsm.*

Six specimens, bred from somewhat folded mines, occupying the whole upper side of leaves of *Ledum glandulosum*, found in June in Mendocino County, Cal., and bred the same month. I met with this species also on the wing at the same time and place. It appears to be nearly allied to *salicicolella* Sircom, among the European species.

Lithocolletis alnicolella, sp. n.

Antennæ, whitish, very faintly spotted above.

Palpi, white.

Head, face white, frontal tuft grayish saffron.

Thorax, pale grayish saffron touched with white at the sides.

Fore-wings, pale grayish saffron with three dorsal and four costal silvery-white streaks, all dark-margined on their inner sides and at their points; a somewhat broad but very indistinct white medio-basal streak extends above the fold to one-third the wing-length, and a shorter streak of the same color follows the dorsal margin from the base to half the length of the one above it; the first dorsal streak is broad, outwardly oblique, and reaching nearly to the smaller triangular costal streak above it; in some specimens it actually attains to it, forming an angulated fascia; the point of the second dorsal, also somewhat triangular, is directed a little beyond the point of the second costal streak above it; these are both nearly perpendicular; the third dorsal very small; arising opposite the space between the third and fourth costal streaks, it reaches to the apex of the former; the end of the wing is inclosed by a dark semicircular line at the base of the cilia, within which is an elongate blackish spot; the cilia are grayish, with a faint saffron tinge.

Hind-wings and cilia, also pale grayish.

Abdomen, gray above, anal tuft scarcely paler.

Posterior tibiæ, whitish, unspotted.

Exp. al. 6mm.

Type, ♂ ♀ *Mus. Wlsm.*

Two specimens were bred from larvæ found mining the upper sides of leaves of *Alnus incana* on Mount Shasta, Siskiyou County, Cal., in August, 1871, in which month the perfect insects emerged. Three other specimens were met with on the wing, also in the neighborhood of Mount Shasta. Judging from Chambers' description, his *alnivorella* must be exceedingly close to this species. There are certain distinct differences in the position and extent of the dorsal streaks, but my chief reason for regarding it as distinct is that Chambers describes the larva of *alnivorella* as feeding on the under side of the leaf, whereas my species feeds on the upper side of another species of alder. I am not aware of any instance of an alder-feeding *Lithocolletis* feeding on both sides of the leaves.

Lithocolletis incanella sp. n.

Antennæ, whitish, faintly spotted above.

Palpi, shining white.

Head, face shining white, frontal tuft white, with a few saffron scales at the sides.

Thorax, bright reddish-saffron, with a thin whitish line running around its anterior margin and communicating with the basal streak on the fore-wing.

Fore-wings, bright brownish-saffron with a long slender medio-basal white streak without dark margins, four costal and three dorsal streaks of the same color, sometimes with a slight metallic sheen; the first costal streak is a little before the middle of the wing, oblique and pointed, with a scarcely perceptible dark dusting along its inner margin; the first dorsal streak commences a little nearer to the base; it is dark-margined internally, and is somewhat wider than and reaches a little beyond the costal streak beyond it; the second costal streak is small and points slightly outwards; the third is nearly perpendicular; the fourth points slightly inwards from a little before the apex; these three are all dark-margined on their inner edge; opposite to these are the second and third dorsal streaks; the second is triangular, wider at the base and dark margined internally, its black dusting communicating with a patch of similar blackish scales at its apex extending to the second costal streak above it; the third dorsal streak is short, pointing inwards and dark margined on *both* sides, its outer margin being continuous with a dark line at the base of the cilia which encircles the tip of the wing reaching to the exterior costal streak; within this line, but separate from it, is an elongate apical spot of somewhat disconnected blackish scales, the cilia pale greyish.

Hind-wings and cilia, pale grayish.

Abdomen, dark gray above, anal tuft somewhat paler.

Hind tarsi, white, tipped with grayish, and two grayish-saffron spots above.

Exp. al., 9^{mm}.

Type, ♂ ♀ *Mus. Wlsm.*

The larva feeds in mines on the under side of *Alnus incana* towards the end of June in Colusia County, Cal., the perfect insects emerged in July, 1871. Seven specimens were bred, and the species was also met with on the wing at Burney Creek (near Pit River), Shasta County, Cal.

GENERAL NOTES.

THE AMENDED CALIFORNIA HORTICULTURAL LAW.

We take from the *Los Angeles Evening Express*, of July 12, the following amendments to the old act to protect and promote the horticultural interests of the State. The act embodying these amendments was approved March 20. Entomological legislation is so unusual in this country that these rulings will be read with interest:

SEC. 1. Section 1 of said act is hereby amended so as to read as follows:

"SEC. 1. Whenever a petition is presented to the board of supervisors of any county, and signed by twenty-five or more persons who are resident freeholders and possessors of an orchard, or both, stating that certain or all orchards or nurseries, or trees of any variety, are infested with scale insects of any kind, injurious to fruit, fruit trees, and vines, codlin moth, or other insects that are destructive to trees, and praying that a commission be appointed by them whose duty it shall be to supervise their destruction as herein provided, the board of supervisors shall, within twenty days thereafter, select three commissioners for the county, to be known as a county board

of horticultural commissioners. The board of supervisors may fill any vacancy that may occur in said commission by death, resignation, or otherwise, and appoint one commissioner each year, one month or thereabouts previous to the expiration of the term of office of any member of said commission. The said commission shall serve for a term of three years from the date of their appointment, except the commissioners first appointed, one of whom shall serve for one year, and one of whom shall serve for two years, and one of whom shall serve for three years from the date of appointment. The commissioners first appointed shall themselves decide, by lot or otherwise, who shall serve for one year, who shall serve for two years, and who shall serve for three years, and shall notify the board of supervisors of the result of their choice."

SEC. 2. Section two of said act is hereby amended so as to read as follows:

"SEC. 2. It shall be the duty of the county board of horticultural commissioners in each county, whenever it shall deem it necessary, to cause an inspection to be made of any orchard or nursery or trees or any fruit-packing house, store-room, sales-room, or any other place in their jurisdiction, and if found infested with scale-bug, codlin moth, or other insect pests injurious to fruit, trees and vines, they shall notify the owner or owners, or person or persons in charge or possession of the said trees or place, as aforesaid, that the same are infested with said insects, or any of them, or their eggs or larva, and they shall require such person or persons to disinfect or destroy the same within a certain time to be specified. If within such specified time such disinfection or destruction has not been accomplished, the said person or persons shall be required to make application of such treatment for the purpose of destroying them as said commissioners may prescribe. Said notices may be served upon the person or persons owning or having charge or possession of such infested trees, or places, or articles, as aforesaid, by any commissioner, or by any person deputed by the said commissioners for that purpose, or they may be served in the same manner as a summons in a civil action. If the owner or owners, or the person or persons, in charge or possession of any orchard, or nursery, or trees, or places, or articles infested with said insects, or any of them, or their larva or eggs, after having been notified as above to destroy the same, or make application of treatment, as directed, shall fail, neglect, or refuse so to do, he or they shall be deemed guilty of maintaining a public nuisance, and any such orchards, nurseries, trees, or places, or articles thus infested, shall be adjudged and the same is hereby declared a public nuisance, and may be proceeded against as such. If found guilty, the court shall direct the aforesaid county board of horticultural commissioners to abate the nuisance. The expenses thus incurred may be a lien upon the real property of the defendant."

SEC. 3. Section three of said act is amended so as to read as follows:

"Sec. 3. Said county boards of horticultural commissioners shall have power to divide the county into districts, and to appoint a local inspector for each of said districts. The state board of horticulture, or the quarantine officer of said board, shall issue commissions as quarantine guardians to the members of said county boards of horticultural commissioners and to the local inspectors thereof. The said quarantine guardians, local inspectors, or members of said county boards of horticultural commissioners shall have full authority to enter into any orchard, nursery, or place or places where trees or plants are kept and offered for sale or otherwise, or any house, store-room, sales-room, depot, or any other such place in their jurisdiction, to inspect the same or any part thereof."

SEC. 4. Section four of said act is hereby amended so as to read as follows:

"SEC. 4. It shall be the duty of said county board of horticultural commissioners to keep a record of their official doings, and to make a report to the State board of horticulture, on or before the first day of October of each year, of the condition of the fruit interests in their several districts, what is being done to eradicate the insect pests and diseases, also as to carrying out of all laws relative to the greatest good of the fruit interest. Said board shall publish said reports in bulletin form, or may incorporate so much of the same in their annual reports as may be of general interest."

SEC. 5. Section five of said act is hereby amended so as to read as follows:

"SEC. 5. Each member of the county board of horticultural commissioners, and each local inspector, shall be paid for each day actually engaged in the performance of his duties under this act, payable out of the county treasury of his county, such compensation as shall be determined by resolution of the board of supervisors of the county, before entering into the discharge of his or their duties."

SEC. 6. Section six of said act is hereby amended so as to read as follows:

"SEC. 6. Said county boards of horticultural commissioners shall have power to remove any local inspector who shall fail to perform the duties of his office."

SEC. 7. Section seven of said act is hereby repealed.

SEC. 8. Section eight of said act is hereby amended so as to read as follows, and to be known as section seven of said act, viz:

"SEC. 7. If any member of the county board of horticultural commissioners shall fail to perform their duties of his office, as required by this act, he may be removed from office by the board of supervisors, and the vacancy thus formed shall be filled by appointment by the board of supervisors."

SEC. 9. Section 9 of said act is hereby amended so as to read as follows, and to be known as section 8 of said act, viz:

"SEC. 8. It shall be the duty of the county board of horticultural commissioners to keep a record of their official doings and to make a monthly report to the board of supervisors, and the board of supervisors may withhold warrant for salary of said members and inspectors thereof until such time as said report is made."

SEC. 10. A new section is hereby added to said act, to be known as section 9, and to read as follows, viz:

"SEC. 9. All acts and parts of acts in conflict with the provisions of this act are hereby repealed."

SEC. 11. This act shall take effect and to be in force from and after its passage.

NEW CODLING MOTH AND PEACH-BORER ENEMIES.

Prof. E. A. Popenoe, in the *Industrialist* for June 6, mentions an interesting new parasite of the Codling Moth, which he determines as a new species of the genus Bethylus. Of this parasite 5 larvæ were found in a group feeding externally upon the dorsum of one of the abdominal segments of an Apple-worm taken from the interior of an apple. The larvæ spun yellow cocoons after arriving at full growth, and in fact their habit seems to be quite similar to that of Chalcids of the genus Euplectrus.

He also describes the manner in which the larvæ of *Trogosita obscura* devour the pupæ of the Codling Moth under tree bands.

He also states that he bred a large number of specimens of a honey-yellow Braconid from larvæ and pupæ of the Peach-tree Borer. We are surprised to notice that he states that he has not been able to find in any of the entomological reports reference to any parasites of this insect, and we may call attention to the statement upon page 255 of the Annual Report of this Department for 1879, that Professor Comstock during that year bred 4 parasites—2 Chalcids, 1 Microgaster, and 1 Braconid. Professor Riley has reared from the Ægeria *Phæogenes ater* Cress. and *Bracon nigrifectus* Riley MS.

Professor Popenoe's article is illustrated by figures of the Bethylus and Trogosita, which have been admirably drawn by Mr. C. L. Marlatt.

SOME PACIFIC COAST HABITS OF THE CODLING MOTH.

We have recently learned of certain interesting observations which seem to indicate that the Codling Moth differs slightly in habit in California from its customs in the East. Mr. Koebele, writing us under date of July 24, states that, at the end of May of the present season, when the apples were about 1 inch in diameter, he noticed the moths appearing in numbers. Soon after sunset they began to swarm around the trees, chiefly near the top, and kept it up until dark. He noticed small bats feeding upon them abundantly. This, he thinks, is the time of oviposition. He noticed, however, that the eggs were chiefly laid on the upper side of the fruit, and with pears often upon the stem. Few of the larvæ, according to his observations, entered the fruit at the spot where the egg was deposited, but beginning a slight hole at this point, they left it after becoming slightly larger and entered the fruit at the lower end. These observations were made in the Santa Cruz Mountains.

Similarly, Mr. B. D. Wier, in his Codling-Moth Notes, published in the *Pacific Rural Press* of June 8, from which we have previously quoted, states that, according to his observations, the egg is, as a rule, laid elsewhere than in the calyx.

THE EFFECT OF ARSENICAL INSECTICIDES UPON THE HONEY BEE.

The prevailing opinion seems to favor the theory, that if arsenical mixtures are sprayed or dusted upon fruit trees while the latter are in bloom the bees which frequent them will be destroyed. With this idea in view fruit-growers have very properly been cautioned not to use these mixtures during the blooming season, and in fact this has been urged as an argument against the use of these substances as insecticides.

The writer, while in Louisiana, was told by planters that dusting Paris Green upon the cotton plants killed the bees which frequented the blossoms thereon for the purpose of securing the nectar which was contained in them.

There appears, however, to be some good negative evidence bearing upon the problem, which it will be well to consider before forming a decided opinion in this really important matter.

Mr. Edwin Yenowine, a fruit-grower near New Albany, Ind., is a very strong advocate of the use of arsenical mixtures, as against both Codling Moth and Plum Curculio, and is also, to a limited extent, engaged in apiculture.

Some time ago, while spending a day with Mr. Yenowine, he reminded me that several years ago he had written me as to the probable effects on bees of the use, during the blooming season, of these arsenical mixtures, and had received a very cautionary reply. It appears that instead of following my advice he sprayed all sorts of fruits freely, both

in and out of the blooming season, and instead of destroying his bees they have increased from 8 to 17 strong, healthy colonies, and have furnished honey of which he and his family have partaken freely. This conversation with Mr. Yenowine took place on the 23d of June, so that the increase shown was practically that of an unfavorable season.—F. M. WEBSTER.

NEMATODE INJURY TO CANE-FIELDS IN JAVA.

In connection with the forthcoming Bulletin 20 of this Division, on Nematode Worms injurious to the roots of plants in Florida, may be given a short notice of an article by Dr. F. Soltwedei on Nematodes working in the roots of sugar-cane in Java, taken from the *Agricultural and Horticultural Review* of August 1, 1887, which was inclosed by Vice and Deputy Consul Horatio G. Wood, of the United States consulate at Batavia, with his report to the Department of State, and reprinted with the same in the reports of consuls of this Government for May of the present year. In the remarks on the sugar-cane disease in Java, which form the subject of the report referred to and bear date of March 13, 1889, Consul Wood states that a congress composed of planters, exporters, and persons interested in the sugar production of Java, has just closed its session at Samarang. The object of this congress was mainly to discuss the cause and cure of the Nematode attacks on the cane-roots, there called the "sereh" disease, which is now spreading most rapidly and disastrously through the cane-fields of western and central Java, having been first discovered on the island only three years ago in plantations near Cheribon, a sea-port town on the north coast 125 miles to the eastward from Batavia. The report further states that the congress has subscribed a fund of $90,000 for the purpose of engaging a bacteriologist from Europe to visit the island, investigate the disease, and propose its remedy. The Nematodes reduce not only the quantity of the sugar crop but its quality as well, and the subject is therefore of the utmost importance in cane-growing regions.

Dr. Soltwedei, in his article, mentions having discovered in the cane roots the following genera, which all belong to the family Anguillulidæ: *Dorylaimus*, only once; several species of *Tylenchus*, of which the one found almost always attendant upon the "sereh" disease, seems to be new, and is named by him *T. sacchari*; and one species of *Heterodera*, *H. javanica*, which also seems when it occurs to cause the "sereh" disease, but has so far been discovered in only a few plants. *Tylenchus sacchari* has been found there also in the roots of sorghum, while several forms of *Tylenchus* have besides been discovered in the roots of rice and maize, though it can not at present be said with certainty that *T. sacchari* is among these. Some few observations are made on the latter, and, as nearly as can be ascertained, it feeds only in the young and juicy rootlets which sprout directly from the stalk, these becoming its breeding places. A description is given of the male and

female, with the size of the same and of the egg, and remarks on the various organs, including those of generation and the spermatic fluid. The parasite can not be introduced except in earth from infested regions, and it appears that a great deal of moisture is required to complete its development. Dr. Soltwedei's article is merely preliminary and does not suggest any remedies.—T. T.

THE IMPORTATION OF OCNERIA DISPAR.

We are greatly interested to learn from the *New England Farmer* of July 13 that the larvæ of this well-known European insect, which is a rather large bombycid moth, have made their appearance in the town of Medford, Mass., feeding upon "everything from garden vegetables to oak leaves." The identification seems to have been made by Mrs. Fernald, and consequently can not be questioned.

In the latter part of July we received from Mrs. N. W. C. Holt, of Winchester, Mass., some young caterpillars on Mulberry and Apple which we take to be the larvæ of this insect. The importation at this late date of such a conspicuous species is of great interest.

ANOTHER LEAF-HOPPER REMEDY.

Mr. George West, of Stockton, Cal., according to the *Vineyardist* of July 15, has given the plan of feeding off his grape leaves by sheep, as a remedy for the grape-leaf hopper, a full test. Last fall, after the crop had all been gathered, he turned 3,000 head of sheep into his 600-acre vineyard, and in a short time they had eaten every vestige of foliage off the vines, leaving them completely bare. This year there has been no sign of the hopper.

A CABBAGE-MAGGOT EXPERIMENT.

An experiment with lime and liquid manure for the Cabbage Maggot, made upon a large scale by Mr. D. M. Dunning, of Cayuga County, N. Y., has resulted in the perfect success of the liquid manure and a partial success of the gas-lime.

HOW OFTEN HAS THIS BEEN NOTICED?

In a half-grown Cecropia larva, found August 7 upon Birch in the grounds of the Department of Agriculture, the left-hand tubercle on the back of the first abdominal segment is entirely wanting. There is not the slightest trace of it. The right-hand tubercle is as large as usual, and in every other respect the specimen is normal.

OBITUARY.

We are pained to learn of the death of Dr. Anton Ausserer, which occurred July 20 at Graz, Germany. Dr. Ausserer was a prominent worker in arachnology, and, in addition to a number of shorter papers,

produced the only authoritative monograph of the exceptionally difficult family Territelariæ.

DOES THE WHEAT-STEM MAGGOT, MEROMYZA AMERICANA, DISCRIMINATE BETWEEN DIFFERENT VARIETIES OF WHEAT?

In the literature of this species nothing seems to have been recorded relative to its preference for certain varieties of wheats or indicating that any such discrimination has been witnessed.

During the five years that I have been located at the Purdue Experiment Station the small experiment plats, comprising from 40 to 50 different varieties of wheats, have shown but little difference in the extent of injury, which has in all cases been rather slight.

In larger fields there seems to be a difference in the severity of the attack of the spring brood of larvæ, which has this year been extremely well marked, especially between Velvet Chaff and Michigan Amber. Two fields sown the same day in September, 1888, on the same kind of soil, and in fact every perceivable element being equal except variety of seed, one of which was Velvet Chaff and the other Michigan Amber, suffered very differently; the former, on the 14th of June, having fully four infested straws to one in the latter. In a long, narrow plat, extending some distance between the two fields and being composed of both of these varieties mixed in about equal proportions, the ratio of injury to each was about the same as in the larger fields. The difference between the attack in the two varieties was sufficiently marked to attract the attention of Prof. W. C. Latta, agriculturist of the station, who is neither an entomologist nor familiar with the insect itself.

It is with a view of learning if this partiality is general, and also if it has been observed to extend to other varieties, that the question is here propounded and the observations given.—F. M. WEBSTER.

THE ASSOCIATION OF OFFICIAL ECONOMIC ENTOMOLOGISTS.

In pursuance of the call issued by Mr. James Fletcher, president of the Entomological Club of the American Association for the Advancement of Science, a meeting of those interested in the formation of such an association as that described in the title to this note was held August 29 and 30, at Toronto, Canada.

The following constitution was first adopted:

This association shall be known as the Association of Official Economic Entomologists.

Its objects shall be: (1) To discuss new discoveries, to exchange experiences, and to carefully consider the best methods of work; (2) to give opportunity to individual workers of announcing proposed investigations, so as to bring out suggestions and prevent unnecessary duplication of work; (3) to suggest, when possible, certain lines of investigation upon subjects of general interest; (4) to promote the study and advance the science of entomology.

The membership shall be confined to workers in economic entomology. All economic entomologists employed by the general or State Governments or by the State

Experimental Stations or by any agricultural or horticultural association, and all teachers of economic entomology in educational institutions may become members of the association by transmitting proper credentials to the secretary, and by authorizing him to sign their names to this constitution. Other persons engaged in practical work in economic entomology may be elected by a two-thirds vote of the members present at a regular meeting and shall be termed associate members. Members residing outside of the United States or Canada shall be designated foreign members. Associate and foreign members shall not be entitled to hold office or to vote.

The officers shall consist of a president, two vice-presidents and a secretary, to be elected annually, who shall perform the duties customarily incumbent upon their respective offices. The president shall not hold office for two consecutive terms.

The annual meeting shall be held at such place and time as may be decided upon by the association at the previous annual meeting. Special meetings may be called by a majority of the officers, or shall be called on the written request of not less than five members. Eight members shall constitute a quorum for the transaction of business.

The mode of publication of the proceedings of the association shall be decided upon by open vote at each annual meeting.

All proposed alterations or amendments to this constitution shall be referred to a select committee of three at any regular meeting, and, after a report from such committee, may be adopted by a two-thirds vote of the members present: *Provided,* That a written notice of the proposed amendment has been sent to every voting member of the association at least one month prior to date of action.

The adoption of the constitution was followed by an election of officers, which resulted as follows: President, Dr. C. V. Riley, U. S. Entomologist; first vice-president, Prof. S. A. Forbes, State Entomologist of Illinois; second vice-president, Prof. A. J. Cook, Professor of Entomology in the Michigan Agricultural College; secretary, Prof. J. B. Smith, Entomologist to the New Jersey Agricultural Experiment Station.

The charter members are as follows: C. V. Riley, of Washington; S. A. Forbes, of Illinois; A. J. Cook, of Michigan; J. B. Smith, of New Jersey; J. A. Lintner, of New York; J. H. Comstock, of New York; F. L. Harvey, of Maine; M. L. Beckwith, of Delaware; C. M. Weed, of Ohio; F. M. Webster, of Indiana; J. P. Campbell, of Georgia; James Fletcher, of Canada; C. J. S. Bethune, of Canada; E. Baynes Reed, of Canada; William Saunders, of Canada; E. J. Wickson, of California; C. W. Woodworth, of Arkansas; H. Garman, of Kentucky; O. Lugger, of Minnesota; C. P. Gillette, of Iowa; H. Osborn, of Iowa; L. Bruner, of Nebraska; L. O. Howard, of Washington, and one or two others, whose names we are not able to announce at the present time.

The association adjourned August 30 to meet the coming winter at the time and place of meeting of the Association of Experiment Stations, presumably at Washington, the coming November.

THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

This organization met at Toronto, Canada, August 28 to September 3. Among the members in attendance were Mr. James Fletcher, Prof. A. J. Cook, Prof. J. B. Smith, Prof. H. Garman, Mr. E. Baynes Reed,

Rev. C. J. S. Bethune, Mr. William Saunders, Dr. P. R. Hoy, Mr. C. M. Weed, Mr. L. O. Howard, Mr. J. Alston Moffat, Mr. H. H. Lyman, Rev. W. A. Burman, Prof. C. W. Hargitt, Mr. E. P. Thompson.

The address of the president, Mr. James Fletcher, dealt principally with the injurious insects of the year, and was of extreme interest. It was also warmly discussed. Other papers were read by Professors Cook and Smith and by Messrs. Weed, Lyman, Fletcher, and Howard. Papers were also read which had been received from Prof. C. H. Fernald, Mr. W. H. Edwards, and Dr. F. W. Goding.

The officers elected for the next meeting are: Prof. A. J. Cook, president; Rev. C. J. S. Bethune, vice-president; Prof. F. M. Webster, secretary.

DYNASTES TITYUS IN INDIANA.

Although a southern species, this insect is known to occur in the southern portions of some of the Northern States. Say recorded its occurrence, in an old cherry tree, near Philadelphia, lat. 39° 57′ N., and this is looked upon as its probable northern limit, from whence it can be traced westward through Indiana, Illinois, and Missouri, but only in localities considerably further southward.

In December, 1886, Prof. A. H. Graham, superintendent of the public schools of Columbus, Ind., lat. 39° 13′ N., showed me a specimen which had been found on the top of one of the school buildings, by workmen engaged in repairing the roof. Pennsylvania excepted, this seems to be the northernmost locality where the species has been found. Fruit-growers accuse the larvæ of destroying the roots of the grape.—F. M. Webster.

THE FIELD CRICKET DESTROYING STRAWBERRIES.

Although this insect has not, so far as I am aware, been recorded as destructive to the fruit of the Strawberry, nevertheless it has long been accused of such depredations by strawberry growers. Several years ago a gentleman of Mississippi, whose name I have mislaid, complained of serious injury to his berries by these insects, stating that they first ate the seeds and then the pulp. More recently similar accusations have come from the fruit-growers of southern Indiana; but in none of these cases have the crickets been actually observed feeding on the berry.

While this might indicate that other insects were, perhaps, equally implicated, it is also true that this cricket is a shy fellow, and in order to observe him in the act of feeding one must use the utmost caution. Only once have I been able to detect them in the act of destroying the fruit as accused. This was on June 3, 1886, when I captured an individual which had made such progress in devouring a ripening berry as to leave no doubt regarding the capabilities of his race in that direction. —F. M. Webster.

THE PLUM CURCULIO SCARE IN CALIFORNIA.

Recent advices from one of our California agents, Mr. D. W. Coquillett, show that the published statements in the California newspapers of late date to the effect that the Plum Curculio has made its appearance in Los Angeles County, are entirely unfounded. Fuller's Rose Beetle (*Aramigus fulleri*) has been mistaken for *Conotrachelus nenuphar*. The Rose Beetle has been found to be very destructive in that vicinity to the leaves of Evergreen Oaks, Camelias, Palms (*Washingtonia fillifera*), *Canna indica*, and several other plants.

LACHNUS LONGISTIGMA ON THE LINDEN IN WASHINGTON.

The Linden Tree-louse, *Lachnus longistigma* Monell, described in Thomas' Third Report on the Insects of Illinois, pp. 119 and 120, and which bears a close resemblance to *L. platanicola* Riley, has so far been recorded on the Linden in only one locality, Monell having observed it a few miles west of St. Louis, as he states in his description of the insect. This instance is noted by Packard in the Seventh Bulletin of the U. S. Entomological Commission (p. 127), where it constitutes the sole mention of the occurrence of this Lachnus.

As a record for the Eastern United States, it may be mentioned that the species is abundant this year (1889) in Washington on trees of the European Linden, a number of which have been found infested in the northwest part of the city. The first tree was examined on August 18, when the insects were in abundance on the underside of the lower limbs, and some winged specimens were found amongst them, while the pavement beneath was stained with their exudations and held the honey-dew in little puddles; the same being observed under infested trees noticed later.

This species differs from *L. platanicola* in being larger, with the wings more dusky and the stigma black. It is also interesting to note that some experiments carried on by Mr. Pergande, of this Division, in transferring specimens of *L. platanicola* to Linden and *L. longistigma* to Sycamore, resulted in both cases in the failure of the colonies.—T. T.

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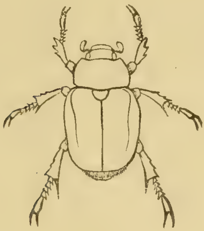
INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS.



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SPECIAL NOTES.

Greeting.—The writer is pleased to greet more directly again the readers of INSECT LIFE, after an absence of five months, the most enjoyable portions of which have been the ocean voyages going and coming. Paris is proverbially beautiful, and we met many delightful people there, among them not a few entomologists; but America never looked more fair nor Washington more attractive to our eyes than upon our return, and, while it would be incorrect to say that we are more ready for work (which has not been intermitted, but was simply transferred to other scenes) we cheerfully relieve Mr. Howard from the Divisional harness and give him an opportunity for well-merited rest and vacation. In doing so we desire to publicly thank him, as also the rest of the Divisional force, for the manner in which his and their several duties have been discharged.—C. V. R.

Lestophonus or Cryptochætum—Professor Mik's Opinion.—In the August number of the *Wiener Entomologische Zeitung* Prof. Josef Mik, in commenting upon Dr. Williston's "Note on the Genus Lestophonus" in the May number of INSECT LIFE (Vol. I, p. 328), confirms Dr. Williston's placing of this form in the *Ochthiphilinæ*, and states that, in his opinion, there can hardly be any doubt regarding the identity of *Lestophonus* with Rondani's *Cryptochætum*. The figures of the wing, he states, agree perfectly, and so do the descriptions. He says that Rondani in his expression "Areola basali antica incompleta" does not refer to the anterior but to the posterior basal cell, as can be seen from the third part of the Prodromus (Fig. VII^{k} of the plate) of this author.

Entomology in Ohio.—We received September 13th the Annual Report of the Ohio Agricultural Experiment Station for 1888, which contains upon pages 122 to 176 the Report of the Entomologist, Mr. C. M. Weed.

The principal articles are upon experiments in preventing the injuries of the Plum Curculio; a practical preventive of Rose Bug injuries to grapes and peaches; on some insects affecting Currants and Gooseberries; notes on some Raspberry Insects; on the autumn life-history of certain little-known Plant-lice; notes on various insects affecting garden crops; heat as a remedy for Bean and Pea Weevils; the Chinch Bug in Ohio; on two Potato Insects (*Epicærus imbricatus* and *Doryphora* 10-*lineata*); on injuries of the Striped Grape-vine Beetle, and a list of the articles published by the entomologist during the year. The report is carefully prepared and well printed, the most valuable contribution to the knowledge being the account of the experiments with arsenicals against the Curculio, showing, as they do, the utility of the arsenicals for this purpose, and confirming the conclusions which we expressed in our last annual report. Many of the articles have been published elsewhere in advance.

Rosin Wash for Red Scale.—In accordance with instructions from the vision, Mr. Coquillett has been making experiments with this wash against the red scale (*Aspidiotus aurantii*), and after twenty different tests made with various preparations, from the 17th of July to the 8th of August, the one which gave the best results was found to be composed of rosin, 20 pounds, caustic soda (70 per cent. strength), 6 pounds, fish oil, 3 pounds, and water to make 100 gallons. In preparing this wash the necessary materials were placed in a boiler and covered with water and then boiled until dissolved and stirred occasionally during the boiling. After dissolving, the preparation was boiled briskly for about an hour, a small quantity of cold water being added whenever there was danger of boiling over. The boiler was then filled up with cold water, which mixed perfectly when added slowly and frequently stirred. It was then transferred to a strong tank and diluted with water to 100 gallons. Neither the leaves nor the fruit were injured, while a large proportion of the scales were destroyed. Those which escaped were either on the fruit or the underside of the leaves. The cost of the wash is 80 cents for 100 gallons or four-fifths of a cent per gallon. An orange tree 16 feet tall by 14 feet in diameter was given 14 gallons. This, however, seems to us to be an unnecessarily large amount, but upon this basis the cost of spraying per tree is 11.2 cents.

Meeting of Association of Economic Entomologists.—A notice from the secretary is published on page 123.

THE HORN-FLY.

(*Hæmatobia serrata* Robineau-Desvoidy.)

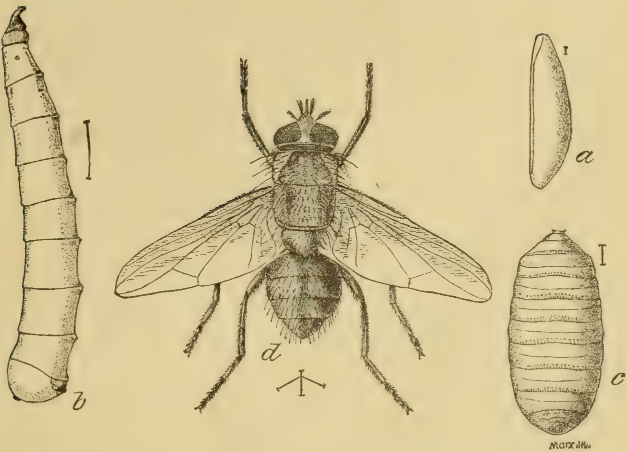


FIG. 11.—HÆMATOBIA SERRATA: *a*, egg; *b*, larva; *c*, puparium; *d*, adult in biting position—all enlarged. (Original.)

Our knowledge of this pest is now sufficiently far advanced to enable us to present a preliminary article giving the main facts ascertained. A more complete article will, however, be published in our annual report for the year.

FIRST APPEARANCE—SPREAD—INVESTIGATION.

Our attention was first called to this pest in September, 1887, when Mr. I. W. Nicholson, of Camden, N. J., wrote us under date of September 22, as follows:

Herewith I send some specimens of flies which appear to have made their first appearance about the middle of August. They are very annoying to cattle, but rarely settle upon the horses or mules. They gather in patches or clusters particularly upon the legs, and are very active. I should like to know if they are common in other parts of the United States. They appear to be very numerous in all the counties near Philadelphia, yet I have seen no person who has observed them before this season.

Later letters the same season from Mr. Nicholson mentioned the common habit of clustering upon the horns, and the fact that after a severe frost in the middle of October the fly disappeared.

May 15, 1888, the same gentleman wrote us that the flies had promptly made their appearance May 10, or a little before, in great numbers. A few days later we heard of the same insect in Harford County, Md.,

through Mr. George R. Stephenson, who reported its occurrence in that locality the previous summer.

By the summer of 1889 the pest had extended in numbers much farther to the southward, and the Department was early informed of its occurrence in Harford and Howard Counties, Md., and Prince William, Fauquier, Stafford, Culpeper, Louisa, Augusta, Buckingham, and Bedford Counties, Va. The alarm became so great that we were anxious to learn all that was possible about the species, and arranged to have it investigated. Considerable time has therefore been devoted to the study of the habits and life history of the insect. This was done mainly by Mr. Howard, who made a number of short trips to The Plains, Warrenton, and Calverton during June and July. Later in the season Mr. Marlatt assisted in the work, which had been greatly facilitated by Mr. G. M. Bastable, Mr. David Whittaker, Mr. M. M. Green, and Mr. William Johnson, and particularly by Col. Robert Beverly. To the courtesies of these gentlemen we would acknowledge our indebtedness. August 20 Mr. Howard found the flies practically in Washington—in Georgetown—and the next day Mr. Marlatt found them in Rosslyn, at the Virginia end of the Aqueduct Bridge, so that further trips for material were not necessary.

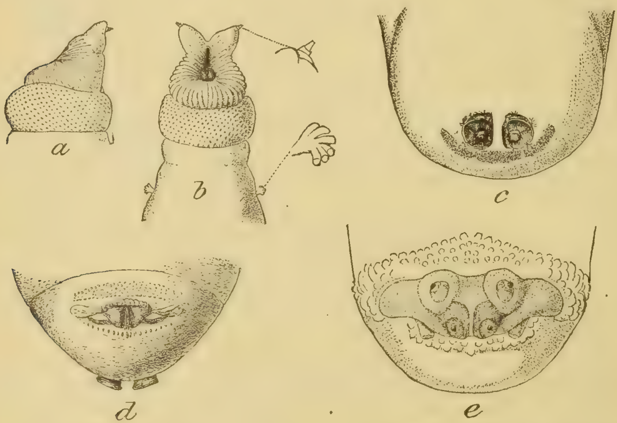


FIG. 12.—HÆMATOBIA SERRATA: *a*, side view of head of larva; *b*, ventral view of head of larva, showing antennæ and thoracic stigmata; *c*, dorsal view of anal end of larva, showing anal stigmata; *d*, anal plate of puparium; *e*, ventral view of anal end of larva, showing anal plate—still more enlarged. (Original.)

The result of the summer's observations by these two gentlemen is that the life history of the insect has been accurately made out from the egg to the fly through several consecutive generations, and that substances can be recommended which, from their experience, will keep the flies away for from five to six days, while from the life history

a suggestion as to preventives is made, which, under certain circumstances, will prove undoubtedly of great benefit.

IS IT A NATIVE OR AN IMPORTED PEST?

Since this insect was first brought to our notice we have felt that it was an imported pest. Its first appearance in the neighborhood of Philadelphia and its gradual spread southward have favored this idea. Dr. Williston, to whom we sent specimens for name, wrote us that he thought it an introduced species, and very close to *Hæmatobia serrata* of Robineau-Desvoidy, differing only in color of legs and antennæ. He has since, however, described it as a new species (see *Entomologica Americana*, Vol. V, No. 9, September, 1889, pp. 180–181), under the name *Hæmatobia cornicola*, giving *H. serrata* as a questionable synonym. His published remarks on this point are:

> I can not resist the belief that the species is an introduced one, and suspect that it may be identical with *H. serrata* R.-Desv., occurring in France. Aside, however, from the discrepancies that his description shows in the color of the legs, an identification of this author's species is usually, at least, only a guess. Macquart's very brief description is better; but the palpi are distinctly enlarged, and he says they are not. Nothing but a comparison of the specimens will settle the question.

Meantime Dr. Lintner had sent specimens to Baron Osten-Sacken at Berlin, who determined them, as Dr. Lintner informs us in a letter dated September 16, as the European *serrata*, placing it in the closely allied genus or subgenus *Lyperosia* of Rondani. We are quite inclined to accept Baron Osten-Sacken's dictum in this matter and so also we feel assured will Dr. Williston, and we hence conclude that our species is the European *serrata*, whether it be ultimately placed in *Hæmatobia* or *Lyperosia* both of which genera were split off from *Stomoxys* and are considered by Schiner as subgenera of this last. At present we shall follow Dr. Williston in placing it in *Hæmatobia*.

We know little of the European geographical distribution of *H. serrata*. Robineau-Desvoidy described it from France and Schiner gives its location as south France, while Macquart gives it as inhabiting the south of France, and records it specifically from Bordeaux. The fact that in this country it has spread with much greater rapidity towards the south than towards the north would seem to indicate that it is a south European species.

The habits of Hæmatobia in Europe are given by Railliet* as follows:

> The Hæmatobias are very small flies which live in the fields and seldom penetrate into the stables. As their name indicates, they are at least as blood-thirsty as Stomoxys. They attack the animals in the pastures, particularly cattle, and they often collect in great numbers upon a single individual, with their wings expanded, working in through the hairs to pierce the skin. *H. stimulans* Meig. and *H. ferox* R.-D. are the principal species of our region.—[France.]

The exact time and place of the introduction, it is impossible to ascertain. Upon its first importation in small numbers it was probably for

* Éléments de Zoologie Médicale et Agricole.

some time unnoticed, and its first noticeable appearance may not have been at the point of importation.

All imported cattle from Europe pass through the quarantine stations of this Department at either Littleton, Mass., Garfield, N. J., or Patapsco, Md., and an examination of the records developes one or two points of interest. Since 1884 only ten head of cattle have been imported into the country direct from France. All of these have passed through the New Jersey station, but their ultimate destinations have in no cases been within the regions now infested with the fly. The other importations have been from points like Antwerp, London, Amsterdam, Hamburg, Glasgow, Liverpool, Southampton, Hull, Rotterdam, and Bristol. The year 1886, immediately preceding the appearance of the fly, was marked by quite an extensive importation of Holsteins from Amsterdam and Rotterdam and London, through the Garfield station, mainly for parties in New York City. Over three hundred were imported, and an interesting point to investigate will, therefore, be the occurrence or non-occurrence of this fly in Holland.

POPULAR NAMES AND POPULAR ERRORS.

The popular name which is here adopted—the "Horn Fly"—has the sanction of popular use. It is sufficiently distinctive and we therefore recommend its adoption. The name of "Texas Fly" and "Buffalo Fly" and "Buffalo Gnat" are also in use in some sections and indicate an impression that the insect came from the West. Dr. Lintner uses the term "Cow-horn Fly." Objections may be urged to all of these.

The most prominent of the popular errors is the belief that the fly damages the horn, eats into its substance, causes it to rot, and even lays eggs in it which hatch into maggots and may penetrate to the brain. There is no foundation for these beliefs. As we shall show later, the flies congregate on the bases of the horns only to rest where they are not liable to be disturbed. While they are there they are always found in the characteristic resting position, as shown in Fig. 14, and described later. Where they have been clustering thickly on the horns, the latter become "fly-specked" and appear at a little distance as though they might be damaged, and it is doubtless this fact which has given rise to the erroneous opinions cited.

LIFE HISTORY.

THE EGG.—*Place, Method, and Time of Oviposition.*—Mr. Howard's first impression upon entering the field, that the eggs would be found to be laid in freshly dropped dung, proved to be correct. He brought to Washington with him from Calverton dung dropped on the night of July 28 and exposed in the field during the 29th, and from this dung the first adult flies, five in number, issued August 7, only ten days from the laying of the eggs. This settled the point of place of oviposition and breeding. It seemed probable that this was the only substance in which the species breeds, as indeed it is the only likely substance which

exists in sufficient quantity through the pastures to harbor the multitudes of flies which are constantly issuing through the summer. However, many living females were captured and placed in breeding cages with horse-dung and decaying animal and vegetable material of different kinds, each isolated, and it resulted that a few oviposited in the horse-dung and four flies were reared from this substance. There is no evidence, however, that in a state of nature the flies will lay their eggs in anything but cow-dung.

The time and manner of oviposition were puzzling at first. After hours of close watching of fresh dung in pastures close to grazing cattle not a single Hæmatobia was seen to visit the dung, much less to lay an egg. This close observation was made at all times of the day from dawn till dusk without result, while breeding-cage experiments were all the time proving that nearly all fresh droppings contained many eggs. With some hesitation, therefore, the inference was made that the eggs were presumably laid at night, as stated in the note upon p. 60 of the August number of INSECT LIFE.

The question was, however, considered by no means settled, and on the discovery of the fly at Rosslyn Mr. Marlatt was directed to make especial observations upon this point. The first result was that careful examination of dung dropped in the early morning (prior to 7 a. m.) showed very few eggs, not more than eight or ten to a single dropping, while that dropped between 4 p. m. and later in the night contained still fewer. On a dung dropped between 10 and 11.30 a. m. in the hot sunshine, however, examination, a few minutes after, showed a large number of eggs—estimated at three hundred and fifty. Other very fresh droppings were examined and the eggs were found to range from none at all to over three hundred. One animal was then fortunately observed, from close quarters, in the act of passing her dung. As the operation commenced, forty or fifty of the flies moved from the flank to the back of the thigh near the "milk mirror," and at the close of the operation they were seen to dart instantly to the dung and to move quickly over its surface, stopping but an instant to deposit an egg. The abdomen and ovipositor were fully extended and the wings were held in a resting position. Most of them had left the dung at the expiration of thirty seconds, while a few still remained at the expiration of a minute. Every individual had returned to the cow, however, in little more than a minute. This explains the previous non-success in observing the act of oviposition, for the Virginia cattle on the large stock-farms are comparatively wild, and although the dung was examined as speedily as possible after dropping, the flies had already left.

The results, therefore, indicate that the eggs are deposited during daylight, chiefly during the warmer time of the day, between 9 and 4, and mainly between 9 in the morning and noon. They are laid singly, and never in clusters, and usually on their sides on the surface of the wet dung; seldom inserted in cracks.

Description.—Length, 1.25^{mm} to 1.37^{mm}; width, 0.34^{mm} to 0.41^{mm}. Shape, irregular oval, nearly straight along one side, convex along the other. General color, light reddish brown, lighter after hatching. General surface covered with a hexagonal, epithelial-like sculpture, each cell from .027^{mm} to .033^{mm} in length by about half the width. In the unhatched egg, even in those just deposited, a long, rather narrow, ribbon-like strip is noticed along the entire length of the flattened side, rather spatuloid in shape. In hatching this strip splits off, remaining attached at one end, and the larva emerges from the resulting slit.

LARVA.—After the eggs hatch the larvæ descend into the dung, remaining, however, rather near the surface.

Newly-hatched Larva.—Length, 2.45^{mm}, and greatest width, 0.48^{mm}. Color, pure white. Joints of segments rather plainly marked, venter with slightly elevated ridges at ends of abdominal segments, the ridges with delicate sparse rugosities. Resembles in main full-grown larva.

Full-grown Larva.—Length, 7^{mm}; greatest width, 2 to 2.5^{mm}. Color, dirty white. Antennæ 3-jointed, last joint pointed. Head with a lamellar or ridged structure shown in figure; divided by cleft at tip; skin behind lamellar structure coarsely granulated, while that of thoracic and abdominal joints is nearly smooth. Thoracic stigmata pedunculate with six pedunculate orifices. Ridges on venter of abdominal joints not strong, fainter than in young larva. Anal stigmata large, slightly protruding, very dark brown, nearly round, flattened on proximal borders, slightly longer than broad, 0.14^{mm} in length, with one central round opening, and a series of very delicate marginal tufts of cilia, four tufts for each spiracle, each issuing from a cleft, but none on the proximal edge. Anal segment below with a dark yellow chitinous plate showing six irregular paired tubercles; the surface of the skin surrounding the plate rather coarsely granulated.

PUPARIUM.—When ready to transform the larvæ evidently descend from the dung into the ground below from a half to three-quarters of an inch. Actual observations were made on larvæ in dung in breeding-cages where the soil was fine sand, affording ready entrance to the larvæ. Where the dung has been dropped upon hard ground the probabilities are that they will not enter so deeply, and may indeed transform upon the surface of the ground at the bottom of the dung.

Description.—The puparium is from 4^{mm} to 4.5^{mm} in length, by 2^{mm} to 2.5^{mm} in width, regularly ellipsoidal, the head rather more pointed; dark brown in color. The segments are plainly separated. The anal stigmata are darker in color than the rest of the skin; are slightly protruded and preserve the same shape as in the larva. The central opening is still visible, as are the slight indentations of the border. The ventral plate, noticed at the base of the anal segment of the larva is still noticeable as a series of tubercular elevations.

DURATION OF THE PREPARATORY STAGES AND CONSEQUENT NUMBER OF ANNUAL GENERATIONS.—The first flies reared at the Department issued August 7 from eggs deposited July 28. These were five or six in number. August 8 four more issued from the same lot. August 12 six flies issued, reared from eggs laid July 31; August 13 two more, and August 14 two more from the same lot. Delayed specimens issued from this lot August 20 and 23. August 26 seven flies were reared from two or three days' old dung, collected August 17. These observations show the bulk of the flies during late July and August to issue from ten to fifteen days from the laying of the eggs. In all cases the eggs hatched

in less than twenty-four hours. Experiments a little later gave the following periods:

Aug. 21. Eggs deposited in confinement placed at 7 p. m. on cow dung free from eggs of other flies.
23. Larvæ one-fourth grown.
25. Larvæ one-half inch long.
27. Larvæ leaving manure and entering sand to pupate.
Sept. 5. Three flies issued.

Aug. 23. Eggs placed with isolated dung at 1.30 p. m.
24. (9 a. m.) Eggs have hatched.
25. Larvæ one-fourth inch long.
29. Apparently full grown.
30. Puparia found.
Sept. 5. Two flies issued.
6. Four flies issued.

1. Eggs deposited 10.25 a m.
2. Eggs were hatched when examined at 9 a. m.
5. Larvæ half grown.
7. Larvæ entering sand.
8. Five puparia taken from sand.
9. All in puparia.
15. Three adults.
16. Twenty adults. } All found at 9 a. m.
17. Twenty-six adults.
17. Twenty adults, issued between 12 and 4 p. m.

From these records it will be seen that from ten to seventeen days, say two weeks, is about the average time from the laying of the egg to the appearance of the flies, and with four active breeding months, from May 15 to September 15, there will be eight generations. The flies will undoubtedly breed later than September 15, but we may allow this time to make up for the time occupied in the development of the eggs in the abdomen of the female. With seven or eight annual generations the numbers of the flies are not surprising.

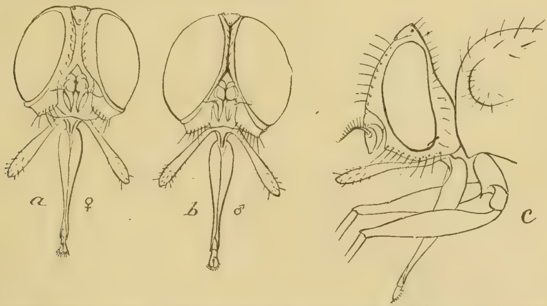


FIG. 13.—HÆMATOBIA SERRATA: *a*, head of female, front view; *b*, head of male, front view; *c*, head from side—all enlarged. (Original.)

THE ADULT—*Its Habits.*—The flies were observed in the greatest abundance during July. They make their first noticeable appearance

in Virginia early in May, and, from hearsay evidence, remain until "late in the fall" or until "right cold weather." At the date of the present writing, September 28, they are still as abundant as ever around Washington. The characteristic habit of clustering about the base of the horn seems to exist only when the flies are quite abundant. When they average only a hundred or so to a single animal, comparatively few will be found on the horns. Moreover, as a general thing the horn-clustering habit seems to be more predominant earlier in the season than later, although the flies may seem to be nearly as numerous. The clustering upon the horns, although it has excited considerable alarm, is not productive of the slightest harm to the animal. Careful study of the insects in the field show that they assume two characteristic positions, one while feeding and the other while resting. It is the resting position in which they are always found when upon the horns. In this position the wings are held nearly flat down the back, overlapping at base and diverging only moderately at tip (see Fig. 14). The beak is held in a nearly horizontal position and the legs are not widely spread. In the active sucking position, however, the wings are slightly elevated and are held out from the body, not at right angles, but approaching it, approximately an angle of 60 degrees from the abdomen. The legs are spread out widely, and the beak, inserted beneath the skin of the animal, is held in nearly a perpendicular position, approaching that in Fig. 13*c*. The fly, before inserting its beak, has worked its way through the hairs close to the skin. While feeding, however, the hairs which can be seen over its body do not seem to interfere with its speedy flight when alarmed, for at a fling of the tail or an impatient turn of the head the flies rise instantly in a cloud for a foot or two, returning again as quickly and resuming their former positions.

FIG. 14.—HÆMATOBIA SERRATA: Adult in resting position—enlarged. (Original.)

The horns are not the only resting places, for with the horns black for 2 inches above their base we have seen the flies towards nightfall settle in vast numbers upon the back between the head and fore shoulders, where they can be reached by neither tail nor head. When feeding they are found over the back and flanks and on the legs. During a rain-storm they flock beneath the belly. When the animal is

lying down a favorite place of attack seems to be under the thigh and back belly, around the bag. With certain animals the dewlap seems to be badly attacked while with others this portion of the body is about exempt. Certain cattle again will be covered with flies and will lose condition rapidly, while others are but slightly troubled.

FIG. 15.—Cow-horn showing band of resting flies—reduced. (Original.)

On the horns the flies settle thickly near the base, often forming a complete band for a distance of 2 inches or more. (See Fig. 15.) They seem to prefer the concave side to the convex side of the curve of the horn, probably for the reason that the cow can not scrape them off so readily, and one cow was noticed in which they reached nearly to the tip of the horn on the concave side of the curve only.

Description.—For a description of the adult we may adopt that sent us by Dr. Williston, which was drawn up from Virginia specimens which we had sent to him, and which is substantially identical with that published by him recently in *Entomologica Americana* (*loc. cit.*).

Male.—Length 3.5 to 4^{mm}. Sides of the front gently concave, its least width about equal to one-fourth of the distance from the foremost ocellus to the base of the antennæ; in the middle a narrow, dark brown stripe; a single row of slender bristles on each side. Antennæ brownish red; second joint slightly tumid; third joint a little longer than broad, with its inferior angle rectangular; arista swollen at the base (which is black), the pectination long. The narrow sides of the front, and the still narrower facial and genial orbits silvery gray, with a slightly yellowish cast; facial foviæ and cheeks blackish, the latter clothed with yellowish hair. Palpi black, the inner surface and immediate base more yellowish; gently spatulate in shape, nearly as long as the proboscis, and extending two-thirds of their length beyond the oral margin. Mesonotum sub-shining black in ground-color, but mostly concealed beneath a brownish dust, which, on the pleuræ, is more grayish. Abdomen with similar dust; in the middle with a more brownish sub-interrupted stripe, and narrow darker posterior margins to the segment. Femora black, or very deep brown, first two pairs of tibiæ and tarsi brownish yellow or luteous, the hind tibiæ and tarsi blackish brown; hind tibiæ on the posterior surface with a noticeable, erect, subapical bristle; hind tarsi about as long as their tibiæ, the first three joints widened from their base to tip, so

as to form a distinct serration on their inner, acute angles, each of which terminates in a long hair. Wings with a light blackish tinge (due to microscopic pubescence), the immediate base yellowish, the first posterior cell rather symmetrically narrowed to terminate broadly at the extreme tip of the wing.

Female.—Front straight on the sides, its width about equal to one-half of the distance from the foremost ocellus to the base of the antennæ; the median deep brown stripe about as wide as the pruinose sides. Palpi yellow, with the margins and tip blackish. Legs more yellowish; hind tarsi regular; pulvilli and claws small.

AMOUNT OF DAMAGE.

The amount of damage done by the fly has been exaggerated by some and underestimated by others. We have heard many rumors of the death of animals from its attacks, but have been unable to substantiate a single case. We believe that the flies alone will never cause the death of an animal. They reduce the condition of stock to a considerable extent, and in the case of milch cows the yield of milk is reduced from one-fourth to one-half. It is our opinion that their bites seldom even produce sores by themselves, although we have seen a number of cases where large sores had been made by the cattle rubbing themselves against trees and fences in an endeavor to allay the irritation caused by the bites; or, in spots where they could not rub, by licking constantly with the tongue, as about the bag and on the inside of the hind thighs. A sore once started in this way will increase with the continued irritation by the flies and will be difficult to heal. Those who underestimate the damage believe that the fles do not suck blood, but such persons have doubtless watched the flies only upon the horns or elsewhere in their resting position when the beak is not inserted, or have caught them and crushed them when their bodies contained little blood. In reality the flies suck a considerable amount of blood, however, and it is their only nourishment; if captured and crushed at the right time the most skeptical individual will be convinced.

REMEDIES.

Preventive Applications.—Almost any greasy substance will keep the flies away for several days. A number of experiments were tried in the field, with the result that train-oil alone, and train-oil with a little sulphur or carbolic acid added, will keep the flies away for from five to six days, while with a small proportion of carbolic acid it will have a healing effect upon sores which may have formed. Train-oil should not cost more than from 50 to 75 cents per gallon, and a gallon will anoint a number of animals. Common axle grease, costing 10 cents per box, will answer nearly as well, and this substance has been extensively and successfully used by Mr. William Johnson, a large stock dealer at Warrenton, Va. Tallow has also been used to good advantage. The practice of smearing the horns with pine or coal-tar simply repels them from these parts. Train-oil or fish-oil seems to be more lasting in its effects than any other of the substances used.

Applications to destroy the Fly.—A great deal has been said during the summer concerning the merits of a proprietary substance, consisting mainly of tobacco dust and creosote, known as "X. O. Dust," and manufactured by a Baltimore firm, as an application to cattle, and it has received an indorsement from Prof. J. B. Smith, Entomologist to the New Jersey Experiment Station. We are convinced that this substance has considerable merit as an insecticide, and know from experience that it will kill many of the flies when it touches them, although they die slowly, and a few may recover. The substance costs 25 cents per pound, and is not lasting in its effects. Where it is dusted through the hair the flies on alighting will not remain long enough to bite, but two days later, according to our experience, they are again present in as great numbers as before. A spray of kerosene emulsion directed upon a cow would kill the flies quite as surely, and would be cheaper, but we do not advise an attempt to reduce the numbers of the pest by actually killing the flies.

How to destroy the early Stages.—Throwing a spadeful of lime upon a cow dung will destroy the larvæ which are living in it, and as in almost every pasture there are some one or two spots where the cattle preferably congregate during the heat of the day, the dung which contains most of the larvæ will consequently be more or less together and easy to treat at once. If the evil should increase, therefore, it will well pay a stock raiser to start a load of lime through his field occasionally, particularly in May or June, as every larva killed then represents the death of very many flies during August. We feel certain that this course will be found in many cases practical and of great avail and will often be an advantage to the pasture besides.

OTHER FLIES REARED FROM COW DUNG.

Our observations on the life-history of the Horn-fly have been greatly hindered and rendered difficult by the fact that fresh cow dung is the nidus for a number of species of Diptera, some of about the same size and general appearance. We have in fact, chiefly this summer, reared no less than twenty distinct species of flies from horse and cow dung, mainly from the latter, and six species of parasitic insects. We shall give these some consideration in our final article in the annual report, but can not elaborate here. The plan finally adopted to secure the isolation of the Hæmatobias was to remove the eggs from the surface of the dung and place them with dung which was absolutely fresh and collected practically as it fell from the cow. Even in this way very great care was necessary to prevent the occurrence of other species.

SOME INSECT PESTS OF THE HOUSEHOLD.*

BED-BUGS AND RED ANTS.†

By C. V. Riley.

There is a peculiar propriety in considering these two household pests in the same article, for it is a fact not generally known, and not, I believe, previously published, that the character of the red ant is not wholly bad. It has one redeeming trait, and that is that it will (although perhaps under exceptional conditions) destroy bed-bugs. Has any one ever known a house overrun with red ants in which bed-bugs were common at the same time? I think not. One of my assistants, Mr. Pergande, had an opportunity at Meridian, Miss., during the war, of seeing an old building used as a barracks and filled with bed-bugs, invaded by countless numbers of red ants. Several ants would attack a single full-grown bed-bug, pull off its legs and carry away the helpless body. They penetrated the closest cracks of the rough beds and dragged out old and young bugs and eggs. There is, then, some slight consolation in having the ants about one's house, but with care and cleanliness, especially at the North, there is no excuse for the occurrence of either pest.

THE BED BUG.

(*Acanthia lectularia* L.)

I have occasionally met with a favored individual who had never seen a bed-bug; in fact a well-informed entomologist recently sent me a specimen for name, indicating his non-familiarity with the species! But such fortunate people are rare, and there are very few housekeepers who have not, by accident perhaps, or through slovenly servants, made the intimate acquaintance of the ubiquitous pest delineated herewith.

The bed-bug (*Acanthia lectularia*) has found its way wherever man has pushed, and is too well known to need description. Its odor and the effects of its bites are as universally known, and the word "bed-buggy" has entered our literature as descriptive of a particular class of odors. The original home of the pest is probably Southeastern Europe and the Asiatic and African countries around the eastern end of the Mediterranean. It was introduced into England at least as early as 1503, and doubtless reached America soon after extensive settlement. Certain English writers have endeavored to father the pest

* On account of the inquiries that are continually made of the Entomologist for remedies for our commoner household pests, we have decided to reprint, with slight change or addition, certain articles recently contributed to *Good Housekeeping* (Springfield, Mass.).

† From *Good Housekeeping*, May 25, 1889.

on America, but there is strong evidence that it was known to Aristophanes, Dioscorides, Pliny, and Aristotle.

The adult bug (Fig. 16*b*) is well adapted, from its flattened shape, to entering narrow crevices in the joints of bedsteads or cracks in walls, or in other convenient places of concealment, and in such places the females lay their eggs. These eggs are white, of an oval form, slightly narrowed at one end, and are terminated by a cap which breaks off when the young escape. The young bugs are whitish, and at firts nearly transparent. The head is comparatively broader than in the old bug, and the antennæ are stouter. They molt several times before attaining full growth, and among the specimens in my possession I can distinguish about four distinct stages. The bug figured at 16 *a* has probably molted once, and the differences in the head, thorax, and antennæ, from the full-grown bug, will be readily seen. The disagreeable smell, characteristic of these insects, arises from certain minute odoriferous glands which in the young bug open on the back of the thorax, and in the adults on the lower side of the body.

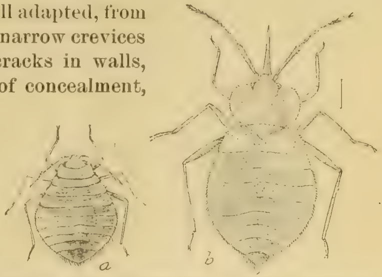


FIG. 16.—ACANTHIA LECTULARIA: *a*, young; *b*, adult—enlarged. (After Riley.)

The number of annual generations depends on conditions of food and warmth. With plenty of food and an even temperature they will multiply with great rapidity, while under contrary conditions reproduction may be greatly retarded. Adult bugs have been known to remain alive for more than a year without a single meal. It is this fasting capacity, together with its form so well adapted for hiding, which renders it so difficult to thoroughly disinfect an infested house.

Here again benzine must be our strongest weapon. Finely sprayed with a hand atomizer it will penetrate the minutest cracks, and is sure death to the insect in all its stages, including the egg. It is a certain remedy, and used thoroughly will destroy every bug in a house. Kerosene is almost as good and is a little more lasting in its effects. Many preventives have been advised, but none are permanent. One of the best formulas for a substance with which to paint the cracks in a bedstead or the wall is one ounce corrosive sublimate, half pint alcohol, and one-fourth pint spirits of turpentine.

It will be a work of supererogation to advise the experienced housekeeper to pay particular attention to the belongings of new servants, and even to the baggage of refined and cleanly guests who come from the South or West and have stopped on the way at hotels. Indeed, I feel that little of a practical nature can be written of this insect that experienced housekeepers will not know already. It may not be out of

place, however, before passing to the red ant to say that the bed-bug has been found in the woods under the bark of trees, and that therefore in country houses in certain localities the occasional presence of the bugs is not necessarily a mark of uncleanliness.

It may be well also to state that there exist other allied bugs which possess much the same odor and whose bite is even more severe than that of the true Bed-bug. The Blood-sucking Cone-nose (*Conorhinus sanguisuga*, Fig. 17) is one of these. It is found occasionally in beds as far north as New Jersey and Illinois, but does not habitually breed in such locations. Its bite is very painful and it will absorb a considerable amount of blood. We show the adult bug and the nearly full-grown larva at 17. The colors are black and red.

a. b.

FIG. 17.—CONORHINUS SANGUISUGA: *a*, mature bug; *b*, pupa. (After Riley.)

THE LITTLE RED ANT.

(*Monomorium pharaonis* L.)

The "red ant," as this insect is almost universally called, is another of the household pests which we seem to owe to the older civilization of Europe, and, like other domestic pests, it has become almost cosmopolitan. It has been generally considered of North American origin, and as one of the few American species which has become wide-spread in Europe. It is often confounded in the literature of the subject with *Myrmica molesta* Say, which is, however, a synonym. In the larger cities of Europe it is as much of a pest to-day as it is in this country. It probably received the scientific name of "Pharaoh's ant" on account of a defective knowledge of Scripture on the part of its describer, who doubtless imagined that ants formed one of the plagues of Egypt in the time of Pharaoh, whereas the only entomological plagues mentioned were lice, flies, and locusts.

Ordinarily in households this insect is not a nuisance from the actual loss which it causes by consuming food products, but from its inordinate faculty of *getting into things*. It is attracted by almost everything in the house, from sugar to shoe polish, and from bath sponges to dead cockroaches. It seems to breed with enormous fecundity, and the incidental killing off of a thousand or so has little effect upon the apparent number. A house badly infested with these creatures is almost uninhabitable. They form their nests in almost any secluded spot, between the walls or under the floors or behind the base-boards, or among the trash in some old box or trunk, or in the lawn or garden walk just outside the door. In each of these nests several females will be found, each laying her hundreds of eggs and attended by a retinue of workers

caring for the larvæ and starting out from dawn till dawn on foraging expeditions in long single files like Indians on the war-path.

FIG. 18.—MONOMORIUM PHARAONIS: *a*, female; *b*, worker enlarged. (After Riley.)

I have shown at figure 18 the female and worker greatly enlarged, and there is nothing in their structure to which I need call especial attention. Nor need I speak further of the habits of the species, and the matter of remedies is soon disposed of. Our first recommendation is to find the point from which they all come. They may have built the nest in some accessible spot, in which case a little kerosene will end a large part if not all of the trouble. If the nest is in the wall or under the floor and taking up a board will not bring it within reach, find the nearest accessible point and devote your energies to killing the ants off as they appear. Where the nests are outside nothing is easier than to find them and to destry the inhabitants with kerosene or bisulphide of carbon. The nests are almost always in the immediate vicinity of the house. The ants are peculiarly susceptible to the action of pyrethrum in any form, be it Persian or Dalmatian powder or buhach, and a free and persistent use of this powder will accomplish much.

A great number of remedies have been proposed in the household columns of various journals, but nearly all depend upon the use of a mixture of some sort for trapping the ants, and at the best are slow and tedious means of warfare. The best of these with which I have had any experience consists in placing small bits of sponge moistened with sweetened water in the spots where the ants most do congregate, collecting the sponges once a day or so, soaking them in hot water and then replacing them. Small bits of bread and poisoned molasses or small vessels of lard in which a few drops of oxalic acid have been put have also been recommended, as well as the free use of borax, so often advised for roaches. The people of the Southern States suffer more from these pests than we do at the North, and a Floridian of experience (Mr. C. G. Cone, of Crescent City) recommends a mixture of borax and sugar, well mixed with boiling water, and left here and there on bits of broken crockery. If any one tries this I should be glad to learn the result.

A much larger black or brownish ant (*Camponotus herculeanus* var. *pennsylvanicus*) often builds its nests in door-yards so close to the houses that it becomes a great nuisance, overrunning the rooms, and even getting into the clothes, so as to be a personal discomfort. A case was brought to my notice two years ago in Washington, where a fine old homestead was on the point of being sold on account of the annoyance caused by these ants. An investigation showed one enormous nest several feet in diameter in the back yard, and several colonies here and there in other parts of the premises. The large colony was completely destroyed by the use of bisulphide of carbon. A teaspoonful was poured down each of a number of openings, and a damp blanket was thrown over them for a few minutes. Then, the blanket being removed, the bisulphide was exploded at the mouth of each hole by means of a light at the end of a pole. The slight explosions drove the poisonous fumes down through the underground tunnels, killing off the ants in enormous numbers. The mains ource of the trouble being thus destroyed, the nuisance was greatly lessened, and all talk of selling the old place has ceased.

IDENTITY OF SCHIZONEURA PANICOLA Thos. AND S. CORNI Fab.

By Herbert Osborn.

Hitherto the species of *Schizoneura* infesting grass roots and dogwood leaves, respectively, have been considered strictly distinct species, and, so far as I can learn, no suspicion has been expressed that they bore any relationship to each other.

My observations the present season establish, I think, beyond question the identity of the species, and that the insects migrate by a winged viviparous brood during the first frosty weather of autumn from the roots of grasses to the leaves of Dogwood, where they establish colonies in great numbers.

Mr. Clarence M. Weed has described the autumn viviparous form and the sexual generation and eggs produced on *Cornus* leaves by what is evidently the same species, though he refers it to *cornicola* Walsh. It is reasonably certain, therefore, that eggs deposited on *Cornus* twigs by the sexual autumn form hatch in spring, producing broods which in early summer give rise to a winged brood making the return migration to roots of grasses.

The full record of observations and evidence establishing this connection can best be presented with observations on the further habits of the species and when certain other points are determined, but the connection of the two species seems a point of sufficient interest to merit the immediate attention of entomologists.

It may be stated here, however, that winged individuals of *S. pani-*

cola bred from grass agree very perfectly with individuals of *S. corni* found on Dogwood establishing colonies directly after the time of migration. Previous to the migration, Dogwood has been free from aphides, as evidenced by condition of leaves and absence of moulted skins or other indication, and finally winged *panicola* reared from grass roots and transferred to *Cornus* leaves, establish colonies agreeing entirely with those of *corni* on the same plant. My specimens agree perfectly with the description of Fabricius (Ent. Syst., IV, 214), but this description is so brief and general that it might not be sufficient for determination. Mr. Oestlund, however (Aphididæ of Minn., p. 28), states that specimens collected in Minnesota agree in all respects with the description and figure by Buckton, and, as my specimens agree perfectly with Mr. Oestlund's description, I adopt his reference to the European *corni*. Walsh's *fungicola* (Proc. Ent. Soc. Phil., I, 304) is apparently a fresh *corni* that he found resting on fungus; and as he describes *cornicola* as like *fungicola*, except abdomen black, I am inclined to think he had simply older or contracted specimens for the description of the latter. Passerini's *Schizoneura venusta* (Gli Afidi, p. 38), infesting roots of grasses in Europe, is evidently the equivalent of *panicola* Thos. in the United States, and I find by turning to Passerini's original description that he mentions its similarity to *corni* Fab., without, however, suggesting any relation between them. He says:

Valde similis, *Schizoneuræ corni*, quæ autem diversa dorso omnino nigro in apteris, et abdominis basi et apice tantum albido in alatis.

All discrepancies in the descriptions (which are very slight) seem to me to be accountable on the ground of difference in appearance of the recently issued and more mature individuals, along with a considerable variation in extent of the black patch on the disk of the abdomen and the number of sensoria on the third joint of the antennæ.

NOTES ON THE BREEDING AND OTHER HABITS OF SOME SPECIES OF CURCULIONIDÆ, ESPECIALLY OF THE GENUS TYLODERMA.

By F. M. Webster.

Speaking from an economic point of view, public interest in the species of the genus *Tyloderma* is at present centered in *fragariæ* Riley,* from the fact that its larvæ burrow into and destroy the thick bulbous root of the strawberry.

The life-history of the insect, from the time the immature larva is found in the plant, has been quite fully studied; but its history up to

*I received this species from Mr. C. N. Ainslie, of Rochester, Minn., in 1880, who stated that it was of rare occurrence.

this period, including the time, place, and method of oviposition, remains a complete blank, so far as published observations are concerned.

About the 20th of November, 1888, I captured a number of adult beetles in an old strawberry field in southern Indiana. Taking them home with me and placing them on plants transplanted to a warm room where the temperature was from 65° to 70° Fahr., they immediately began pairing. A few days later one of the females was observed to eat a hole through one of the bud scales, which at this time enveloped the crown of the plant (all leaves and leaf-stalks having been previously removed), and afterwards reverse her position and push the tip of her abdomen into the hole, dropping, as I supposed, her egg down among the young unfolding leaves. Leaving home on the 6th of December, I did not return again until the last of the following March, during which time both plants and beetles perished.

On the 4th of April I received from Mr. J. C. Beard, of New Albany, Ind., a fresh supply of beetles, composed of both sexes, and from the same field from which I had taken my previous supply. These were not placed on growing plants, but in a glass jar and fed each day with fresh leaves. The sexes were pairing when received, but I secured no eggs until the 7th, when a single egg was found on the bottom of the jar. No more eggs were found until the 17th, when two additional ones were found, also on the bottom of the jar.

The Egg.—The egg is 0.9^{mm} in length, and 0.6^{mm} in breadth, with the ends, each, equally obtusely rounded; color very light yellow, often covered with a whitish, glutinous substance.

I now had over a dozen females in the jar, and, notwithstanding they were pairing with the males constantly, there appeared to be no inclination towards ovipositing. Wishing to learn (1st) whether or not this was due to a lack of favorable conditions, and (2d) if there was any particular part of the plant more favorable than another, I planted three strawberry plants in as many flower-pots, placing the first so deep in the soil that only the leaf stalks were exposed, the second in such a way that it was exposed to the base of the leaf stalks, and the third so as to leave nearly all of the bulbous root exposed above ground. A single female was taken from the jar and placed on the first plant, and covered with a glass. All leaves had been cut away, leaving two leaf stalks each about one and one-half inches in height. After being placed in the jar the female remained perfectly quiet for a few minutes and then began an inspection of the stems. An excavation was made in one of them about an inch above the soil, but was abandoned without being used as a nidus. The second stalk was then taken under consideration and critically examined, after which, with head downward, she began excavating a cavity about one-fourth of an inch above ground, and, after finishing it, she reversed her position and deposited her egg at the mouth of the cavity. The labor of oviposition over, she again turned about, and, after carefully pushing the egg in place, began col-

lecting the down from the stem, pulling it off with her jaws and tucking in, over and about the egg, effectually filling the cavity, the whole operation occupying about one hour and a half.

The second female conducted herself in much the same manner, except that she constructed her egg cell just at the surface of the soil, which was also exactly at the base of the leaf stalk, and, to my astonishment, after placing her egg, filled the cell with mud, and besides drawing the damp earth up about the plant in such a manner as to conceal the spot entirely. The time occupied was about as with the first.

The third began her labor as promptly as either of the others, but punctured the bulbous root about half an inch from the surface of the soil and about the same distance below the base of the leaves, and filled the cavity, after ovipositing, with the loose material on the outside of the root. Time nearly the same as in the others.

The foregoing seemed to indicate to me that the females were withholding their eggs on account of their environment, and as a rule they continued to do this until they died, after the 1st of May. There also appeared to me to be a partiality for ovipositing in the plants somewhere near the surface of the earth, which would ordinarily, and in the fields, be near or just below the juncture of the leaf stems with the root. Dissection of females revealed but few eggs in the ovaries, and these about as large as previously indicated. I, of course, know nothing of the movements of these beetles before they came into my hands, but, judging from my own observations, should not expect them to deposit above a dozen eggs each, and that, under favorable conditions, these eggs might be deposited during March and April or withheld until May, if necessary.

All of the eggs which were deposited in the plants, under my observation, were sacrificed in the attempt to determine the egg period. Two eggs were, however, deposited by other females, about the 3d of May, on the inside of glass tubes, in which they were confined. I watched the development of the larvæ in these eggs, it being a very easy matter to do so through the glass, and that portion of the shell which adhered to the walls of the tube. The larvæ did not reach maturity until nearly the middle of June, and ate through the shell, where the latter was attached to the tube, od the 18th of same month. It must be borne in mind that these eggs were in an unnatural environment, and the results are to be taken for just what they are worth.

The species *foveolatus* Say oviposits in the stems of the Evening Primrose, *Œnothera biennis* L., in June. The method of oviposition is very much the same as in the preceding, the mother beetle covering the cavity, after depositing the egg therein, by raking the epidermis of the stem together, and fixing it in and over the hole, where it dries and forms a sort of scab, remaining until after the wound has wholly or in part healed. The eggs are rather larger than those of *fragariæ*, but shaped and colored much the same. The insect, in all its stages except

the egg, may be found in the stems of this plant during the month of August, the more advanced stages nearest to the ground. The main stem in the one selected and the work of the beetle may be readily detected by their scarred and pitted appearance. Except from being larger, the larvæ of this species do not differ materially in general appearance from the preceding. The punctures which are so apparent in the adult beetle are also to be observed in the pupæ.

Of the breeding habits of *variegatus* Horn, I know nothing, and only refer to the species here in order to record its occurrence in an ant-hill in the month of December.

I have observed *æreus* Say about plants of Evening Primrose, but have not observed them ovipositing. Moreover, have observed them of various sizes and in great numbers in localities where there were no plants of the Primrose.

Ryssematus lineaticollis Say breeds in the seed pods of *Asclepias incarnata*, the larva feeding upon the seeds and transforming to the adult in the late autumn. The larva is white, robust, and much wrinkled, with sparsely-placed, short bristles distributed over the body; the head is much smaller than first segment, yellow, with mouth parts darker. Length when extended 6^{mm}. In the vicinity of La Fayette, Ind., the larvæ are preyed upon by a species of *Bracon*, the larvæ of which leave the body of their host and spin small brown cocoons within the seed pod, several parasites inhabiting a single larva of *Rhyssematus*.

June 18, 1889.

EXTRACTS FROM CORRESPONDENCE.

The Spread of the Australian Lady-bird.

The Vedolia has multiplied in numbers and spread so rapidly that every one of my thirty-two hundred orchard trees is literally swarming with them. All of my ornamental trees, shrubs, and vines which were infested with white scale, are practically cleansed by this wonderful parasite. About one month since I made a public statement that my orchard would be free from "Icerya by November 1," but the work has gone on with such amazing speed and thoroughness, that I am to-day confident that the pest will have been exterminated from my trees by the middle of August. People are coming here daily, and by placing infested branches upon the ground beneath my trees for two hours, can secure colonies of thousands of the Vedolia, which are there in countless numbers sucking food. Over fifty thousand have been taken away to other orchards during the present week, and there are millions still remaining, and I have distributed a total of sixty-three thousand since June 1. I have a list of one hundred and thirty names of persons who have taken the colonies, and as they have been placed in orchards extending from South Pasadena to Azusa, over a belt of country ten miles long and six or seven in width, I feel positive from my own experience, that the entire valley will be practically free from Icerya before the advent of the new year. You will be as much pleased to read this as I am to write it.—[J. R. Dobbins, San Gabriel, Cal., July 2, 1889.

Wasps in India.

A tin trunk belonging to Mrs. Sidney Preston, wife of a gentleman in Her Majesty's civil service, was packed with wearing apparel, etc., in Hoti Murdan, and brought to Jhelum, Punjab, India, in March, 1889. It was left in a veranda for two months and opened in May. It contained, to the surprise of the owner, four large nests of wasps, the ordinary *Vespa* of the district. A small hole was at last discovered near the hinge, affording a possible clue to the entrance of the parent or parents. One of the nests was so large as entirely to fill up a baby's hood. After getting rid of the paper-like nests and the living wasps, which were numerous, the remainder of the clothing in the box was found to be covered with dead wasps in quantities; in fact, with several hundred of them. The contents of the box had been carefully camphored and peppered when packed.—[A. O'D. Taylor, Newport, R. I.

Injurious Insects in New Mexico.

I have forwarded to you by same mail this day a square tin box containing inclosed two small boxes. The larger square box contains a number of specimens of the bean or frijole bug, also two small pupæ of the same insect, and further, a single specimen of a bug said by the sender to prey on his grape-vines. Having no means of killing the insects I forward them as I received them, most of them alive. In the small round box you will find a few specimens of another bug resembling the first somewhat in its markings and general shape, but larger and evidently a different insect. These are all dead, and were collected by myself personally on a plant of the Convolvulus or Ipomæa family, near Bernalillo, in the Rio Grande Valley. Not having a Gray's Manual I am unable to give the plant its name in botany. It is named by the Mexicans, calabaza (gourd) on account of its enormous root, which is supposed to resemble a large, warty species of native gourd. Its flowers, of a pale purple color, resemble very large morning-glories. The plant, which is found in all New Mexico, but especially in the sandy wastes which border the valley proper of the Rio Grande River, is an upright bush with long, narrow leaves. The stems and leaves die out every year, but the root is perennial, and must live many years, for it becomes very hard and woody. The seeds resemble those of the morning-glory, but are much larger. I have described this plant so particularly because the larger of the two species of bugs, which is of a paler color and with fewer and less marked black dots (the one in the small round box), is found in large quantities on the plant; and the Mexicans have an idea, whether correct or not (of this I am no judge because I am not an entomologist), that the frijole chinch (the smaller bug in the square box), which is the destructive bug that preys on the beans, originates from the other.

The convolvulus bug appears early in the spring; I gathered it on the plants myself in May. The Bean bug appears in July. Although I felt satisfied that the two insects are different, and that a bug that preys on the Convolvulus family could not equally prey on beans, I thought this matter of sufficient interest, and brought a handful of convolvulus bugs, which I put in the midst of a small patch of beans growing in the garden, but within ten minutes they had all left, and for two weeks I looked carefully through the beans, but never saw a bug of any kind on them. The Bean bug commits great depredations on bean fields, often destroying them entirely. The only means the Mexicans have found to somewhat prevent its ravages is to plant their beans late, about the middle of July, the bug appearing to swarm in smaller numbers later in the season. The chief season of the Mexican bean bug seems to be from the middle of July to the first of September. The Phaseolus grown by the Mexicans belongs to the same family as our string beans; the pod can be eaten as a string bean, and the bean is of a yellowish brownish color, of ordinary size, somewhat flatish. When cooked and prepared in the Mexican way it is the best bean I have ever eaten, far superior and better flavored than our so-called navy bean, and it would be

a real acquisition to the American bill of fare. The Mexicans eat their beans three times a day—at every meal the year round, if they have them. In a few days I will endeavor to go myself to the place from which these bean bugs (I think you ought to call them Mexican bean bugs if not already named) were sent to me, some 20 miles from Las Vegas, to examine them myself on the vines, and will then send you another lot and describe what I see.—[J. F. Wielandy, Springer, N. Mex., July 23, 1889.

REPLY.—I have your letters of the 22d, 23d, and 24th of July, and also all of the specimens which you mention. I am very much obliged to you for your full information and for the specimens which you send. The insect which you call the New Mexico bean bug is *Epilachna corrupta*, one of the few plant-feeding lady-birds. A congeneric species feeds upon the leaves of squash in the more northern States, and is mentioned by Professor Riley in his fourth Missouri report. The larger beetle found upon Convolvulus is one of the leaf beetles known as *Chelimorpha cribraria*. Your long account in your letter of the 23d is very interesting, and unless you send me something to supersede it after your visit in person to examine the insects in the field, I shall publish it in INSECT LIFE. Among your specimens we also found the common rose bug of the Northern States (*Macrodactylus subspinosus*). The application of an arsenical poison early in the season should be an effective remedy against the bean bug. Your locality is a very interesting one, and I trust you will keep your eyes open for injurious insects for us.—[July 31, 1889.]

SECOND LETTER.—In order to investigate the Mexican bean bug more fully (there being no beans in this immediate neighborhood) I went last Sunday to Watrous, some 50 miles south of this place, on the Atchison, Topeka & Santa Fé Railroad, where I examined them on the farm of Mr. William Kroenig, who is, with me, one of the *very* few persons who take an interest in such matters in New Mexico. The result is that I am enabled to send you to-day the insect in the egg stage, the larva stage, and the imago stage. The pupae I am not able to procure, for reasons apparent enough. In conversing with Mr. Kroenig I find the following facts: That he has known the insect since he has been in this region, which is about forty years; that it was then just as bad as now; that it is found chiefly on beans cultivated in old fields, and on land newly cultivated is comparatively scarce, or even unknown, for the first few years; that frequently it destroys the entire crop; that the only way to keep down its ravages to some extent is to plant the beans during the interval between the first appearance of the bugs and their second appearance in the fall. The question with me is now to find out if they have more than one brood, and if so, how many. During my visit I examined a new field of beans in which there were no insects. From that we went to a corn field in which there were beans planted among the corn. We there found chiefly larvæ, and only 4 bugs. The bugs had apparently laid their eggs and died. The larvæ were nearly all of the same size. I also found 3 bunches of eggs, which, together with the larvæ, I put in the little vial with a mixture of alcohol and water. The parent bug appeared about the 15th of July for the first time in this locality, possibly a few days sooner. On the 28th, they, as well as the eggs, were nearly all gone, I finding, as stated, only 4 bugs and 3 bunches of eggs. I found among them two varieties of lady-bugs, which seemed engaged in preying upon the eggs and small larvæ, and of which I inclose a couple of specimens. I do not know whether the larger, paler colored of the two insects which I take to belong to the lady-bug family is really one; I never saw it before. You will know. The 4 Mexican bean bugs and the lady-bugs are together in one box, and the larvæ in the bottle together with the eggs. I am positive that another appearance of the full-grown bug occurs in September and October, because I saw some of them at that time last year myself. You have no doubt received some of the bugs I have sent you last week inclosed in letters; one being a bug found on a species of Ipomæa or Convolvulus; the other being the notorious Mexican bean bug, which is the brown bug of the Coleoptera order—sixteen spotted. I will continue my observations on this insect. I send you a few bean leaves to show you the manner in which

its depredations are committed. You will notice that it does not eat the leaf, but only the parenchyma on both sides. It also eats the flowers and the very small young pods.

I also send you another box with a bug of the Hemiptera order, which I found in a garden at Las Vegas, preying upon young cabbage plants, which it sucks, causing the leaves to dry and the young plants to wilt and die entirely, in the same manner as the squash bug preys upon Cucurbitæ. This very pretty harlequin-colored Hemipteron appears frequently in immense numbers, living on various plants of the genus Brassica, such as cabbage, mustard, turnip, etc., and sometimes appears in immense numbers, destroying everything and causing very great havoc. It is also said to have existed in this region from time "immemorial." I am told that it has originated on a native plant of the Brassica family, which has purple or bluish flowers, but I have never seen the plant and do not know how the insect propagates itself. I also send you a third, grayish insect, which abounds in immense quantities on the farm of Mr. Kroenig. It is omnivorous, at least apparently. It does especially great damage on young apple trees. I inclose two apple leaves to show how it works, eating the parenchyma, some young trees being entirely denuded in appearance, although none of them die from the effect. They are not entirely killed, only greatly retarded in growth. I have seen this bug on apple trees, pear trees, plum trees, apricots, grape vines, on a native wild species of willow, even on beans, but it does not appear to touch the peach. It abounds in millions, very much like the May bug (hanneton) of Europe. I know nothing about its mode of multiplication. * * * [J. F. Wielandy, Springer, N. Mex., July 30, 1889.

SECOND REPLY.—Thank you very much for your long and interesting letter of the 30th ultimo, concerning the New Mexican Bean Bug. I shall be glad to publish this letter nearly in full. The two Lady-birds which you found feeding upon the eggs are *Hippodamia convergens* and *Coccinella transversoguttata*. The bug which you found upon cabbage is the common Harlequin Cabbage-bug (*Murgantia histrionica*). The beetle which you found upon young apple trees is congeneric with our Rose Bug of the North. It is *Macrodactylus uniformis*. The beans which you inclose have been handed to the head of the Seed Division with the request that they be planted.—[August 5, 1889.]

The Corn-feeding Syrphus-fly.

A few days ago, while passing through a corn-field, I noticed that most of the lower leaves of the plants were brown, yellow, and dried up. My first idea was that this was due to the Chinch Bug. Of course I set to work at once to investigate, and found only a solitary bug here and there, not sufficiently numerous to do any damage. On carefully stripping down the leaves that were partially discolored I found, snugly feeding between the base of the leaf and the stem, many lively but delicate-looking larvæ, sometimes five or six at the base of one leaf. The larvæ seem to be all of one species, but of various sizes, or ages, and here and there in the same places where the larvæ were feeding I found pupæ of different ages, some black and some only recently changed. The stems under the enfolding base of the leaf, where the larvæ feed, are bathed in or covered with the juice of the plant, and the effect produced is exactly the same as that produced by the Chinch Bug. To-day I mailed you a canister, in which I hope you will find plenty of larvæ and pupæ of different ages, if they are not dried up before they reach you. You will also, perhaps, find a few small insects that I found in the same places with the larvæ. No corn can successfully contend with this pest. At this time, although there has been an unusual amount of rain this summer, the leaves of the corn are "sere and brown" half way up the stalk.—[J. G. Barlow, Cadet, Mo., August 9, 1889.

REPLY.—Your letter of the 9th instant with specimens has been received. The insect in corn is a very interesting thing, and you will find it figured and described under the caption of the Corn-feeding Syrphus-fly (*Mesograpta polita*) in No. 1, Vol. I, of INSECT LIFE. Your letter is therefore of considerable interest, and will go on record among our notes.—[August 14, 1889.]

Larvæ of Cephenomyia in a Man's Head.

I was called to see a case to-day, who had just come from Swarthout Cañon, 30 miles from here, the messenger stating that his father had Screw Worms in his nose and wanted me to get them out. I found the patient at the home of his son, in bed. His name is E. P. Fowler; age, 61; occupation, a carpenter; native of New York; raised in Ohio. I found him breathing hard, accelerated pulse and temperature, a bloody mucus issuing from the nose, the passages nearly closed from dried blood and mucus, nose swollen and pain between the eyes, as well as reddened looking in the mouth, with the back parts of a leaden color and covered with mucus. I procured warm water, carbolized it, and took forceps and small plugs of cotton and removed the dried secretions as far as I could. I then came on to the maggots and removed 40 of them with the forceps from the nose. I used a powder-blower and blew into each nostril in different directions an impalpable powder of calomel, after which several maggots came away of themselves. I send you a sample of five of them in this mail. Mr. Wright, my neighbor, being an entomologist, I gave him a number of the maggots. He reports them feeding on a bony piece of raw beef, they having refused cooked beef. I hope to gain some information of the fly, whether it is identical with the Sheep Grub, Green Bottle fly, or is it an individual species. The patient has had nasal catarrh for many years, and it is probable the secretions formed a suitable field for the deposit and development of the maggot.—[Wesley Thompson, M. D., San Bernardino, Cal., August 7, 1889.

REPLY.—Your very interesting letter of August 7 has just come to hand, and the specimens also arrived in good condition. The larvæ which you send do not belong to the species which is ordinarily known as the Screw Worm, but to a different group. Instead of being Muscids they are Œstrids, and although it is impossible to determine the precise species from the larvæ, the genus is *Cephenomyia*. The larvæ of those species of this genus of which we know the larvæ, are found in the nasal passages of deer, and within the last two months we have received from Mrs. Bush, of San José, larvæ taken from the deer which may be the same species as the one which you send. The occurrence of this larvæ in the head of your patient was of course more or less accidental, although not without precedent. I hope that Mr. Wright will succeed in rearing the fly, although the larvæ are evidently not more than half grown, and success seems doubtful.—[August 15, 1889.]

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX, WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By LORD WALSINGHAM.

[*Continued from page 81 of Vol. II.*]

Lithocolletis nemoris sp. n.

Antennæ, white, spotted above with fawn brown.

Palpi, white.

Head, face white, frontal tuft whitish, much mixed with saffron-brown, especially at the sides.

Thorax, saffron.

Fore-wings, rather shining saffron with snow-white markings consisting of two transverse fascia, slightly oblique, and angulated beneath the costal margin, beyond which are one dorsal and two costal streaks; there is no basal streak; the first fascia at one-fourth the wing-length is but slightly angulated, margined with scattered blackish scales, widely on its outer and very indistinctly on its inner side; the second fascia at the middle of the wing is rather more strongly angu-

lated than the first; this is also slenderly dark-margined internally and more widely so externally, the black dusting on its outer side being produced backwards at the angle in the direction of the first costal streak; this is at the commencement of the costal cilia, rather further from the base than the first dorsal streak, which is oblique, its point terminating below the point of the first costal streak; from the points of these two streaks a cloud of black scales proceeds outwards along the middle of the wing, forming a dark patch below and beyond the second costal streak which is situated just before the apex; the cilia are saffron, shading to pale grayish-saffron beyond their faintly darker median line.

Hind wings and cilia, pale grayish, with a very faint saffron tinge.

Abdomen, pale gray, anal tuft saffron-yellow.

Hind tarsi, white with two grayish-fuscous bars above.

Exp. al. 8^{mm}.

Type ♂ ♀ *Mus. Wlsm.*

The puckered mines of this species were found in some abundance in June, 1871, in Mendocino County, California, on the upper sides of leaves of *Vaccinium ovata*, the mine occupying the whole surface of each leaf and causing the margins to approach each other. I took the species also on the wing at the same time and place. This species belong to the same group as *cincinnatiella* Chamb.

Lithocolletis oregonensis sp. n.

Antennæ, closely annulate with white and brown.

Palpi, whitish, dusted with gray externally.

Haustellum, yellow.

Head, face grayish, frontal tuft grayish-fuscous.

Thorax, golden-saffron.

Fore wings, golden-saffron, with four rather shining white fasciæ and a semi-circular white apical streak inclosing a black apical spot and reaching through the cilia on the costal and dorsal margins; the first fascia is situated within one-fourth the wing-length, the dorsal portion of it commencing nearer to the base than the costal portion and proceeding obliquely outward to a little above the fold, the shorter costal portion only being conspicuously dark margined internally; the second fascia, just before the middle, is distinctly curved, almost angulated outwards, and has a conspicuous margin of black scales on its inner side; the third fascia, commencing before the costal cilia, is less curved than the second, but its black inner margin interrupts it in the middle by a short line of black scales; the fourth fascia, at the apical fifth of the wing, is also internally black-margined, but the black scaling is almost interrupted, becoming very slender at the middle of the wings; the apical spot is black, encircled by white as already described; the cilia are grayish, tinged with fuscous about the anal angle, and with a short golden-saffron dash from the black apical spot; there is no line along their base.

Hind wings and cilia, pale grayish.

Abdomen, gray.

Hind tarsi, whitish, thickly spotted with fuscous above.

Exp. al. 7^{mm}.

Type ♀ *Mus. Wlsm.*

Two specimens taken on the wing near Fort The Dalles, on the Columbia River, in northern Oregon, in April, 1872.

A beautiful and distinct species, somewhat allied to the European *scabiosella*. I have unfortunately no knowledge of its food-plant.

Lithocolletis insignis sp. n.

Antennæ, yellowish, unspotted.

Palpi, white.

Head, face white, frontal tuft white with a few saffron scales.

Thorax, white.

Fore-wings, pale saffron, with a rather golden tinge; a broad white basal streak on the upper half of the wing, running parallel to the costal margin for one-third the wing-length, thence deflexed and confluent with the middle of the upper edge of the first very broad white dorsal streak. The basal streak is sometimes extended at the base across the fold reaching to the dorsal margin, thus leaving between itself and the first dorsal streak a small curved, oblique saffron streak; sometimes it is not thus projected across the fold, but upon the dorsal margin beneath it is found a separate short dorso-basal white dash. Above and slightly beyond the point at which the broad basal streak is deflexed there is a very oblique costal streak, somewhat triangular, with its apex reaching nearly to the apex of the much larger first dorsal streak below it; beyond this the second streak, situated just beyond the middle of the costal margin, is of about the same size, also triangular, a little less oblique, and corresponding with a wider and more conspicuous white dorsal patch opposite to it. The third and fourth costal streaks, of which the former points slightly outwards. The latter is perpendicular, reaching nearly (or in some specimens quite) to a white patch on the dorsal margin before the apex, which seems to consist of two confluent white dorsal streaks. At the extreme apex is a minute black apical spot, surrounded by a semi-circular dark line at the base of the apical cilia, which are tinged with golden saffron at the extreme apex. Beneath the apex the cilia are white, blending into saffron-gray about and before the anal angle; all the white markings are distinctly dark-margined on all sides. The white streaks on the fore wings of this species are so large and conspicuous as in some cases to almost obliterate the pale saffron ground-color, and different specimens vary much in the proportionate space occupied by one and the other.

Hind wings and cilia, pale gray.

Abdomen and anal tuft, grayish-white.

Hind tarsi, whitish, spotted above with gray.

Exp. al. 9^{mm}.

Type ♂ ♀ *Mus. Wlsm.*

I met with this very beautiful and distinct species in June, 1871, in Lake and Mendocino Counties, California, and again on Mount Shasta, Siskiyou County, in August of the same year. It is evidently a scarce species, as I met with a single specimen only on each of the four different occasions. I am unable to give any information as to its larval habits. It seems to belong to the same group as *fitchella* and the European species *roboris*, but differs very greatly in the form of its markings.

In addition to the known American species of this genus, I have received two more, which are undescribed, from Dr. Riley, one feeding on *Grindelia robusta*, the other on *Betula*. I prefer to leave their description to my distinguished friend, who has probably a better series of specimens to refer to than I have.

I am indebted to the late Professor Bolander, of San Francisco, and to Mr. W. Carruthers, of the British Museum, for the identification of some of the plants mentioned in this paper.

The following is a list of plants, with the species of *Lithocolletis*, which feed upon them, so far as they are known to me. I have published this in the hope that it may facilitate the collection of further information concerning the life-histories of the very numerous species belonging to this interesting genus.

North American species of Lithocolletis.

Food plants.	Larvæ.	
	Superior.	Inferior.
Tiliaceæ:		
Tilia americana	Tiliella *Chamb*	Lucetrella *Clem.*
Anacardiaceæ:		
Rhus toxicodendrum	Guttifinitella *Clem*	
	Toxicodendri *F. & B*	
Sapindaceæ:		
Æsculus glabra	Guttifinitella	
	Var. Æsculella *Chamb*	
Aceraceæ:		
Acer saccharinum	Aceriella *Clem*	Clemensella *Chamb.*
		Lucidicostella *Clem.*
Leguminosæ:		
Desmodium viridiflorum		Desmodiella *Clem.*
Phaseolus pauciflorus		Desmodiella *Clem.*
Amorpha fruticosa		Uhlerella *Fitch.*
Robinia pseudacacia	Ostensackenella *Fitch*	Ostensackenella *Fitch.*
	Robiniella *Clem*	Robiniella *Clem.*
Robinia viscosa	Robiniella *Clem*	Robiniella *Clem.*
Robinia hispida	Ostensackenella *Fitch*	Ostensackenella *Fitch.*
	Robiniella *Clem*	Robiniella *Clem.*
Robina *sp. ?*	Gemmea *F. & B*	(? Superior and inferior.)
Amphicarpaæ monoica		Morrisella *Fitch.*
Rosaceæ:		
Cerasus serotina		Pomifoliella *Z.*
Prunus americana		Pomifoliella *Z.*
Crataegus tomentosa		Pomifoliella *Z.*
Pyrus coronaria		Pomifoliella *Z.*
Pyrus malus		Pomifoliella *Z.*
Cydonia vulgaris		Pomifoliella *Z.*
Cydonia japonica		Pomifoliella *Z.*
Hamamelideæ:		
Hamamelis virginica	Aceriella *Clem*	
Caprifoliaceæ:		
Lonicera albida		Affinis *F. & B.*
		Fragilella *F. & B.*
Lonicera sempervirens		Fragilella *F. & B.*
Symphoricarpus vulgaris		Fragilella *F. & B.*
		Mariella *Chamb.*
		Symphoricarpella *Chamb.*
Symphoricarpus *sp. ?*		Affinis *F. & B.*
Compositæ:		
Solidago patula		Solidaginis *F. & B.*
Grindelia robusta	*Sp. ?*	
Ambrosia trifida		Ambrosiella *Chamb.*
Helianthus giganteus		Ambrosiella *Chamb.*
		Ignota *F. & B.*
Elephantopus carolinianus		Elephantopodella *F. & B.*
Actinomeris squarrosa		Elephantopodella *F. & B.*
		Amoena *F. & B.*
	Actinomeridis *F. & B*	(? Superior and inferior.)
Verbesina virginica		Elephantopodella *F. & B.*
Ericaceæ:		
Gaultheria shallon	Gaultheriella *Wlsm*	
Ledum glandulosum	Ledella *Wlsm*	
Vacciniaceæ:		
Vaccinium ovatum	Nemoris *Wlsm*	
[*Primulaceæ:*		
Lysimachia lanceolata		Lysimachiella* *Chamb.*]
Laurinieæ:		
Umbellularia californica	Umbellulariæ *Wlsm*	
Ulmaceæ:		
Ulmus americana	Ulmella *Chamb*	Argentinotella *Clem.*
Ulmus fulva	Ulmella *Chamb*	Argentinotella *Clem.*
		Occitanica *F. & B.*
Celtis occidentalis	Celtifoliella *Chamb*	Celtifoliella *Chamb.*
Juglandaceæ:		
Juglans nigra	Caryæfoliella *Clem*	
Juglans cinerea	Caryæfoliella *Clem*	
Carya alba	Caryæfoliella *Clem*	Caryalvella *Chamb.*
Carya olivæformis	Caryæfoliella *Clem*	
Carya *sp. ?*	Eppelsheimii *F. & B*	(? Superior and inferior.)
Cupuliferæ:		
Quercus alba	Bifasciella *Chamb*	Æriferella *Clem.*
	Cincinnatiella *Chamb*	Albanotella *Chamb.*
	Hamadryadella *Clem*	Argentifimbriella *Clem.*
	Tubiferella *Clem*	Basistrigella *Clem.*

* This species has not yet been bred.

North American species of Lithocolletis—Continued.

Food plants.	Larvæ.	
	Superior.	Inferior.
Cupuliferæ—Continued.		
Quercus bicolor	Conglomeratella *Z*	Argentifimbriella ***Clem.***
		Basistrigella *Clem.*
Quercus castanea		Argentifimbriella ***Clem.***
		Basistrigella *Clem.*
		Fitchella *Clem*
		Hagenii *F. & B.*
Quercus macrocarpa	Hamadryadella ***Clem***	Quercibella ***Chamb.***
	Macrocarpella ***F. & B.***	
Quercus nigra		Æriferella *Clem.*
Quercus obtusiloba	Cincinnatiella *Chamb*	Rileyella ***Chamb.***
	Conglomeratella *Z*	
	Hamadryadella ***Clem***	
	Lebertella *F. & B*	
	Quercivorella ***Chamb***	
Quercus prinoides		Basistrigella ***Clem.***
Quercus prinus		Fitchella *Clem.*
		Hagenii ***F. & B.***
Quercus rubra		Minutella ***F. & B.***
		Rileyella *Chamb.*
Quercus tinctoria	Bethuniella ***Chamb***	Æriferella *Clem.*
	Unifasciella *Chamb*	Basistrigella *Clem.*
		Obstrictella *Clem.*
Quercus *sp.?*	Castanella *Chamb*	Diaphanella ***F. & B.***
Castanea americana	Castanella *Chamb*	
	Caryliella *Chamb*	
Fagus sylvatica		Faginella *Z.*
Corylus americana	Coryliella ***Chamb***	
Ostrya virginica	Coryliella, *var.* ostryella *Chamb.*	Obscuricostella ***Clem.***
	Tritæniella *Chamb*	Ostryæfoliella ***Clem.***
Carpinus americana	Coryliella *Chamb*	
Betulaceæ:		
Alnus incana	Alnicolella ***Wlsm***	Incanella *Wlsm.*
Alnus serratula		Auronitens ***F. & B.***
Alnus *sp.?*	Alnivorella *Chamb*	
Betula *sp.?*	*Sp.?* (superior and inferior)	
Salicaceæ:		
Salix alba		Salicifoliella *Chamb.*
Salix babylonica		Salicifoliella *Chamb.*
Salix longifolia		Salicifoliella *Chamb.*
Salix *sp.?*		Atomariella *Z.*
		Scudderella ***F. & B.***
Populus grandidentata		Atomariella *Z.*
Populus tremuloides		Atomeriella *Z.*
Populus *sp.?*		Populiella ***Chamb.***
		Salicifoliella *Chamb.*
Food plants unknown	Alniella (*Z.*) ***F. & B***	(?Alnus.)
	Australisella *Chamb*	
	Bostonica *F. & B*	
	Chambersella *Wlsm*	
	Insignis *Wlsm*	
	Obsoleta *F. & B*	
	Oregonensis *Wlsm*	
	Sexnotella *Chamb*	

(*To be continued.*)

GENERAL NOTES.

THE CABBAGE PLUTELLA IN NEW ZEALAND.

In the last number of INSECT LIFE we mentioned the occurrence of this cabbage pest in South Africa and referred to our previous statement (Annual Report for 1883) concerning its occurrence in Australia. We have now to record the fact that it seems to be well known as a cabbage pest in New Zealand. The *New Zealand Farmer* for August, 1889, states that information is recorded by more than one of its readers concerning this insect and quotes at length from the *New Zealand Country Journal* for May, 1887, an article concerning its habits and damage. The article is illustrated by a reproduction of Curtis's well known figure, and treats of the pest under the English name of "The Diamond Back Turnip Moth." The *Country Journal* we have not had the pleasure of seeing before, and we may mention the fact that the turnip crops of 1886–'87, in the vicinity of Canterbury, suffered to a very serious extent from the ravages of the larvæ of this insect, while the moths might be seen in countless thousands during March and April. So great were the ravages during 1887 that in some instances the turnip crop was reduced to 25 per cent. of its normal condition. This is a serious thing, because in New Zealand of late years the culture of the turnip is increasing enormously, and the author of the article states that without it it would be difficult to profitably carry on the work of bringing into cultivation large areas of new land, and the fertility of areas already under cultivation could not be so well maintained. Without the turnip, moreover, the trade in frozen mutton could not be carried on to such an extent as it promises by the aid of this crop. Many cruciferous plants would also suffer. According to Mr. Fereday, the insect has been known in New Zealand for years past.

CANNIBALISM WITH COCCINELLA.

Apropos of the note from *Science Gossip* in the August issue of INSECT LIFE, concerning the cannibalism of *Coccinella dispar*, I desire to record some observations made in southern Illinois four or five years ago, showing an even more reprehensible habit of some members of this group than the eating of the pupæ. I was studying apple insects for Professor Forbes at the time, in early spring, and some species of Coccinellidæ were very abundant in the orchards of Mr. Parker Earle, at Anna, Ill. Many of them were ovipositing, and the clusters of bright yellow eggs were not uncommon upon the trunk and larger limbs. One species in particular, *Coccinella 9-notata*, I believe, though as I have not my notes with me, I am not certain, was laying eggs abundantly and *was also eating them with avidity.* I caught adult beetles in the act a number of times, and afterwards proved by observations on specimens

in confinement that they are not at all averse to eating eggs presumably of their own species.—[Clarence M. Weed.]

RHODE ISLAND POPULAR NAMES FOR CORYDALUS CORNUTUS.

We are indebted to Prof. W. W. Bailey, of Brown University, Providence, R. I., for the following list of names used in Rhode Island for *Corydalus cornutus* or Hellgramite Fly: Dobsons, Crawlers, Amly, Conniption Bugs, Clipper, Water Grampus, Goggle Goy, Bogart, Crock, Hell Devils, Flip Flaps, Alligators, Ho Jack (locally in Scituate, R. I.), Snake Doctor, Dragon, and Hell Diver.

SOUTHERN SPREAD OF THE COLORADO POTATO-BEETLE.

Apropos to the note on page 22, current volume of INSECT LIFE, allow me to state that there are good reasons for the belief that *Doryphora* 10-*lineata* occurred at Jackson, Miss., in April, 1888. While at Vicksburg, late in April, last year, I was told of their appearance on potatoes, in the vicinity of Jackson, and took pains to question my informer as to their looks, and his replies left no doubt as to the identity of the species.—[F. M. Webster, La Fayette, Ind., July 25, 1889.]

THE GAS PROCESS FOR SCALE INSECTS.

While at Orange I learned of four persons who had used the gas process for ridding their trees of the red scale, and they much preferred it to spraying. Dr. W. B. Wall, the county treasurer of Orange County, told me that it cost him about one and a half times to fumigate what it would to spray the trees with a wash costing one cent a gallon, and that one fumigation accomplished as much good as *three* sprayings, besides leaving the tree in a better condition. There is still considerable injury to the leaves of trees fumigated in very hot weather, but I hope to overcome this by using a tent constructed from a different material than those heretofore used, as there is reason for believing that it is the rays of *light* rather than of heat that decompose the gas.—[D. W. Coquillett, Los Angeles, Cal., July 22, 1889.]

A SAD BLUNDER IN NO. 2.

Unfortunately I allowed a very careless error to appear in print in No. 2 in the item entitled "A Peculiarity of Certain Caddis Flies." The title should read instead of "Caddis Flies," "Trichopterygid Beetles." In reading the German article in the *Entomologische Zeitung* the word "Trichopterygier" impressed me as referring to the Trichoptera and I allowed the item to go to press before discovering the blunder. Professor Riley was absent and about to leave France, so that copy of the item was not sent him, as the mistake would otherwise never have occurred.—[L. O. H.]

ARSENICALS AND THE HONEY BEE.

In the last number of INSECT LIFE, pp. 84–85, in his note on the effect of arsenical insecticides upon the honey bee, Mr. Webster desires to state that it was *during a period of two years* that Mr. Yenowine sprayed all his fruits freely, so that the increase in his bee colonies was practically that of *one* unfavorable season, the season of 1888.

FIRST ANNUAL MEETING OF THE ASSOCIATION OF OFFICIAL ECONOMIC ENTOMOLOGISTS.

The Association of Official Economic Entomologists will hold its first annual meeting in the city of Washington, D. C., on November 12, 1889, at 11 o'clock a. m., in the Entomological rooms of the U. S. National Museum.

According to the resolution of the Association at the Toronto meeting, the annual meeting was to be held on the date and at the place where the Association of Agricultural Colleges and Experiment Stations should next meet. The date and place for the latter meeting having been fixed, the above notice is hereby given to all members of the Association of Economic Entomologists. All titles of communications to be read should be sent to the secretary as soon as possible, and those desiring enrollment as members will also please communicate with the secretary.

JOHN B. SMITH,
Rutgers College, New Brunswick, N. J.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

September 5, 1889.—The society opened with an informal discussion, in the course of which Mr. Schwarz's list of Myrmecophilous insects, read before the last meeting, was increased by the addition of two spiders belonging to the genera *Synemosyna* and *Synageles* by Dr. Marx, and a beetle (*Microrhopala melsheimeri*) by Mr. Ulke.

Mr. Schwarz read a note on the spread of *Sitones hispidulus*, a European clover insect, which has probably been recently imported. Its sudden appearance in great numbers in Washington and the likelihood of its becoming a dangerous enemy to clover in this country were discussed. Additional observations on this insect were made by Messrs. Ulke and Linell.

In a note on a new food plant of *Pieris rapæ*, Mr. Schwarz stated that he had found the eggs, larvæ, and pupæ on *Cakile americana* in July at Cape May, N. J., and Virginia Beach, Va. He questioned whether this plant, which grows abundantly all along the Atlantic coast, has not been instrumental in the spread of the Cabbage butterfly from north to south.

Mr. Schwarz exhibited an exceptionally large specimen of *Lymexylon sericorne*, calling attention to a remarkable secondary sexual character, viz, the flabellate maxillary palpi. These beetles have been found near Washington in and about decaying wood of the red oak.

C. L. MARLATT,
Acting Recording Secretary.

U. S. DEPARTMENT OF AGRICULTURE.

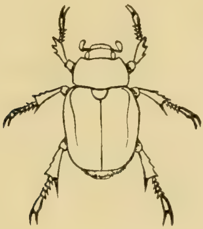
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. NOVEMBER, 1889.

Vol. II. No. 5.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS.



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SPECIAL NOTES.

Work of the Division on the Pacific Coast.—During the past summer Prof. W. A. Henry, director of the Wisconsin Agricultural Experiment Station, was sent by the Secretary of Agriculture to the Pacific coast to report upon certain matters connected with agricultural research in that part of the country, and, incidentally, to look into the work of the agents of the Department and to ascertain the popular feeling regarding the character and importance of their work. Professor Henry has just submitted his report to Secretary Rusk, and that portion relating to the work of the Entomological Division has been referred to us. The several paragraphs reproduced therefrom in another part of this issue will have interest as the testimony of a man of established reputation as an original investigator in practical agriculture.

Food Habits of Snowy Tree-crickets.—We publish in this number an article by Miss Mary E. Murtfeldt, in which she gives the results of some detailed observations which we desired her to make, showing that these insects, particularly *Œcanthus latipennis*, Riley, are insectivorous through all of their stages, and that when deprived of animal food they invariably perish rather than partake of vegetable food. These experiments will undoubtedly interest all entomologists. We have already stated (see Fifth Report on Insects of Missouri, p. 120), that during their early life the young crickets subsist principally upon plant-lice, eggs of other insects, and even upon each other; but that as they grow larger they are often content with a vegetable diet. This statement, however, was made in reference to the common *niveus*. We may, perhaps, infer from Miss Murtfeldt's observations that *Œ. latipennis* is more strictly carnivorous than *niveus*, or possibly that the strictly carnivorous habits were exceptional for this season. Full as her observations are, they require verification by others, and in different seasons, to enable us to lay down the law that the broad-winged species is always an animal feeder.

The Chinch Bug Entomopthora.—In a number of the agricultural journals during the past summer, items have appeared referring to the experiments being conducted by Prof. F. H. Snow, of the Kansas State University, in the intentional dissemination of this disease. We notice in the October 2d issue of the Lawrence (Kan.) *Daily Journal* a long account of the success of the experiments, in which letters to Professor Snow are quoted at length and which thus bear the impress of his sanction. It is stated in this article that Professor Snow obtained some bugs killed by the Entomopthora, and mixed them with live bugs which were soon attacked and died. Repeating this experiment until he had a sufficient number of dead bugs on hand he distributed them in small batches to various farmers, agricultural experiment stations, naturalists, and others—in all, to about fifty persons. Each lot was accompanied with directions to collect ten to twenty times the number of healthy bugs and mix them with the diseased bugs for thirty-six or forty-eight hours, and then turn them loose in the field and watch closely for the result. The letters published are mainly from agriculturists and are favorable. In other words, all the published answers state that the disease seemed to have been communicated.

Ever since Prof. O. Lugger published his apparently favorable results in the same direction, something more than a year ago, we have watched the accounts of subsequent attempts, and endeavored to ascertain whether any thoroughly scientific evidence of the spread of the disease has been established. The matter is of sufficient importance to require the most careful weighing of the evidence, as the apparent evidence is so easily misconstrued, and the danger of unjustified statement and assertion is so great. In this particular article we notice that no dates are given to the letters, and that the correspondents in no way show that the supposed healthy bugs were examined critically, the evidence of life being assumed to mean healthfulness. The chief difficulty is that at the time when the disease is prevalent in one locality the same climatic and zymotic conditions are liable to—and in fact usually do—prevail through a wide extent of country, and that the disease, if it has not already appeared, may be about to appear over the whole area. This at once establishes the necessity of the most careful observations by means of check experiments. If the diseased bugs are simply placed among apparently healthy bugs and the latter subsequently become diseased, the proof of direct transmittal by contagion is but negative. If, however, healthy bugs are isolated from the imported diseased bugs and remain healthy, then a probability is established in favor of the contagion by contamination. The disease is always most prevalent in cool, wet weather, from midsummer on, when large numbers of the older bugs are naturally dying from other causes, and are probably more liable to fall victims to any scourge of this kind.

The subject is of extreme interest, and while there are reasons which would make us doubtful of any tangible and practical results following

the attempted artificial spread and propagation of the disease, and which make us accept with caution the more sanguine views of men like Professors Lugger and Snow, yet there is sufficient promise of such results to justify the fullest and most careful experimentation. This will doubtless be had in the next year or so by the co-operation of the entomologists connected with the different experiment stations. The full life history of the particular Entomopthora is of extreme importance in this connection.

SOME INSECT PESTS OF THE HOUSEHOLD.

By C. V. Riley.

[*Continued from page* 108.]

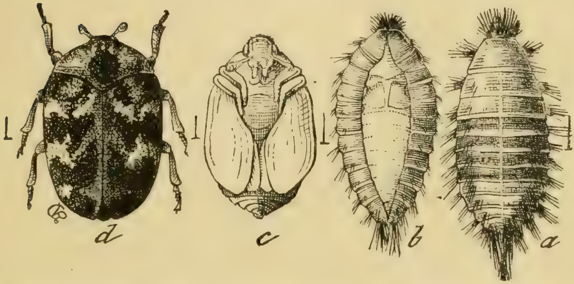

Fig. 19.—Anthrenus scrophulariæ: *a* larva, dorsal view; *b*, *do.*, ventral view; *c*, pupa; *d*, adult—all enlarged (after Riley).

THE CARPET BEETLE, OR SO-CALLED "BUFFALO MOTH."*

(*Anthrenus scrophulariæ* L.)

This destructive insect, the despair of the good housekeeper, has been known in the eastern United States since 1874, when newspaper articles began to appear complaining of its ravages. In 1876, it was first brought to the attention of entomologists by Prof. J. A. Lintner, of Albany, who found it at Schenectady, N. Y. Between 1874 and 1877, it had been found at various points in New Jersey, at Schenectady, Albany, Syracuse, and Buffalo, N. Y., and Boston and Cambridge, Mass. Within this range of cities it has since flourished and done great damage, but has not greatly extended. It is found, however, in all the New England States, and as far west as Illinois, and as far south as Washington, though not a troublesome pest at this last named point.

Like a number of other important insect pests it is a European species, but, although occurring commonly abroad, it is not known as a car-

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* Reprinted substantially from *Good Housekeeping,* April 13, 1889.

pet pest, for the obvious reason that carpets are rare in most European countries. Rugs, which are frequently taken up and shaken, do not offer a comfortable dwelling-place for this insect, which is of a secreting and retiring disposition. It seems probable that the pest was imported almost simultaneously by carpet-dealers in New York and Boston, and thence shipped in goods to inland cities. Dr. H. A. Hagen, in 1875, for instance, was able to trace three-fourths of the infested carpets brought to his notice to a particular line of goods sold at a single establishment in Boston. At the present day this insect is the greatest household pest in our northeastern States. It ruins carpets and all stored woolen goods, while furs do not escape its attacks. Let us then briefly consider its life history and summarize the best remedies to be used against it.

The accompanying figures (Fig. 19 *a* to *d*), which I prepared some twelve years since, illustrate three of the stages of the insect (all except the egg), and the natural sizes are indicated by the hair lines at the side.

The larva, which is the stage in which the insect is most familiar to the housekeeper, is shown at *a* from above, and *b* from below. This is the active feeding state in which it does the damage. The full-grown larva is rather longer than the beetle and is brown in color, clothed with stiff brown hairs, which are longer around the sides than on the back, and still longer at the extremities. Both at sides and extremities they form tufts, the hinder end being furnished with three tufts of long hair, and the head with a dense bunch of shorter hair.

The quiescent state between the larva and the beetle is called the *pupa*, and is shown at *c*. It needs no furthur description, but it should be stated that the *pupa* is seldom seen, being formed within the last partly split skin of the larva.

The perfect beetle, *d*, is three-sixteenths of an inch long, nearly as broad, and broadly elliptical in outline. It draws in its legs and feigns death when disturbed. The figure will enable the housekeeper to recognize it when we explain that its colors are white, black, and scarlet. The black and white are indicated in the figure, while the red is confined to a stripe down the middle of the back, widening into projections at three intervals, and meeting the irregular white bands.

The beetles begin to appear in the Fall and continue to issue through the winter and spring. They soon pair and the females deposit their eggs, probably upon the carpet itself and not in floor-cracks, as is sometimes supposed. The eggs, with favorable temperature, soon hatch, and the larvæ grow apace, molting some six or more times. Under ordinary circumstances there is probably but one annual generation, although there may be more; but, as I have shown by experiment with related species, the larvæ are able to remain for a long time without food, in which case the growth is very slow and the number of molts great. When full grown the larva seeks to hide itself in a crack in the floor or some other convenient shelter and transforms to pupa within the larval skin. After a time the larval skin cracks along

the back, showing the pupa, which later splits open and the beetle emerges.

The beetles fly to the windows during the day-time and may often be caught upon the panes. They are also to be captured outdoors upon the flowers of composite and scrophulariaceous plants, but probably do not voluntarily leave the house until their eggs have been deposited.

As already indicated in the mention of the fact that this insect is not noted as a pest in Europe, the use of rugs instead of carpets is highly to be recommended in localities where it abounds. Rugs are more often shaken out and the pest is thus discouraged.

Where carpets are used, however, and only taken up once a year at "house-cleaning," the conditions are very favorable for the insect's increase, particularly where the house-cleaning is hurriedly and carelessly done. When a house has once become infested nothing but the most energetic measures will completely rid it of the pest, and in complete riddance is the only hope, as in a year a very few individuals will so increase as to do great damage. At house-cleaning time, then, as many rooms should be bared at once as possible, and the housekeeper should go carefully over the rooms, removing all dust, and with a hand-atomizer charged with benzine should puff the liquid into all the floor-cracks and under the base-boards until every crevice has been reached. The carpets themselves, after thorough beating, should be lightly sprayed with the same substance, which will quickly evaporate, leaving no odor after a short time. The inflammability of benzine should be remembered, however, and no light should be brought near it. This done, before relaying the carpets, it will be well to pour into the cracks a moderately thick mixture of plaster of Paris and water, which soon sets and fills them with a solid substance into which the insects will not enter. Then lay around the borders of the room a width of tarred roofing-paper and afterward relay the carpets. This thorough treatment should answer in the very worst cases, and in a house so cleaned the insect will probably not regain a foot-hold during the ensuing year. Cloth-covered furniture which may have also become infested should be steamed or also treated with benzine, and chests or drawers in which infested clothing has been stored should be thoroughly sprayed.

Another method of treatment, and one which I have frequently recommended, was indicated by me in a former communication to *Good Housekeeping* in rendering my decision in the competition for best remedies for household pests. It can be used to advantage whenever the work of the larva is noticed or suspected. It consists in laying a damp cloth (an old towel or a folded sheet will do) smoothly over the suspected part of the carpet, and ironing it with a hot iron. The steam thus generated will pass through the carpet and kill all the insects immediately beneath. If not too laborious, an entire room could be treated to advantage in this way.

Camphor, pepper, tobacco, turpentine, carbolic acid, tallow, pyreth-

rum powder, and many other substances have been recommended from time to time, but all must be considered as inferior to the plans here just outlined.

It has been said that the best housekeepers are the most uncomfortable people in the world, always on the lookout for dirt or indications of insect pests; but if the somewhat elaborate treatment I have given is gone through with once a year, the good housekeeper may then sit down and placidly fold her hands for all the trouble *Anthrenus scrophulariæ* will give her.

THE CARNIVOROUS HABITS OF TREE CRICKETS.

BY MARY E. MURTFELDT.

From observations and experiments on the Snowy Tree Crickets (*Œcanthus niveus* De Geer and *Œ. latipennis* Riley) during the past two summers I incline strongly to the opinion that they should be classed with the beneficial rather than with the injurious species. They are accused of cutting into and sipping the juices of various fruits, of severing the berries from grape clusters, and even of cutting the latter from the vines. In the process of oviposition also they are charged with the destruction of grape and raspberry canes and the twigs of various fruit trees by their punctures and by crowding the pith with their eggs. The latter charge is irrefutable; but when we consider the amount of wood that it is necessary to remove from vines and trees annually, the few twigs punctured by these insects should not be allowed to count against them. As to their injuries to growing fruit, I have never been able to verify any observations of the kind. During the present season I colonized a considerable number—mostly *Œ. latipennis*—on a portion of a grape vine and watched them at all hours of the day, without ever detecting them in the nefarious work of snipping off either berries or bunches. Nor was there any circumstantial evidence of their having done anything of the kind at night. Furthermore all my observations upon them in the rearing cage prove that at no stage of their existence can they subsist on vegetable food, either fruit or foliage. When deprived of other insects for their sustenance, they invariably perished.

Early in June of last year I had a colony of *Œ. niveus* hatch from apple twigs that had also been badly punctured by *Ceresa bubalus.* At hatching each tiny cricket left at the aperture of the bark through which it emerged the filmy pellicle in which it had been inclosed in the egg. There were about a dozen in all, and I kept them under constant observation on my writing-desk. During the day they remained almost motionless in one position, if possible concealed from light and sight on the under side or in the folds of a leaf. They were, from the first, supplied with various berries and tender leaves, but evidently never touched them for food. On the morning of the fourth day two or three were

dead, and showed signs of having been nibbled by their hungry brothers. Some leaves of plum infested with a delicate species of yellow aphis were then put into the jar, but attracted no immediate attention. As twilight deepened, however, the crickets awakened to greater activity. By holding the jar against the light of the window or bringing it suddenly into the lamp-light, the little nocturnal hunters might be seen hurrying, with a furtive, darting movement over the leaves and stems, the head bent down, the antennæ stretched forward, and every sense apparently on the alert. Then the aphides provided for their food would be caught up one after another with eagerness and devoured with violent action of the mouthparts, the antennæ meanwhile playing up and down in evident expression of satisfaction. Unless I had provided very liberally not an aphis would be found in the jar the next morning, and the sluggish crickets would have every appearance of plethora. Later on in their lives, by reducing them to the point of starvation, I repeatedly made them feed in the daytime, so that I might the more distinctly observe the process, which is certainly very interesting.

The growth of the insects is rather slow. Three larval moults take place at intervals of about two weeks. In the case of those reared in the jar the habit of devouring the exuviæ was not very strictly adhered to, although in some instances it was partially eaten. Probably owing to the abundance of legitimate food there was no cannibalism, after the first few days, among my pets, and while they did not seem to seek each other's society they hunted over the same leaves and twigs without injuring each other, though it was amusing to observe the alacrity with which both would retreat if two chanced to come in contact.

Wings were not acquired until late in August, and at this time I again attempted to change their diet to fruit, grapes, plums, etc., an experiment that resulted in the death of all but three of my specimens. Those which remained fed for about two weeks longer upon oak *Tingis*, *Aphis populi*, and on a brownish aphis which infested the new shoots of grape, but neither of the two males essayed any musical performances, nor would the single female that reached its perfect state puncture any of the twigs that were furnished her, and all three died long before those out of doors had ceased to sing.

During the present summer my attention was again attracted to these insects by finding them so constantly and numerously on oaks infested with *Phylloxera rileyi*. Every leaf dotted by the aphis would have its tree cricket in addition to various smaller foes. The species most commonly seen was *Œ. latipennis*, distinguished to casual observation by its somewhat larger size and by the brilliant orange red or red and yellow dorsal stripe of the pupæ. The size and the broader wings sufficiently characterize the mature insect. A close examination reveals many less obvious distinctions between the two.

I found that one specimen of *Œcanthus* would clear the *Phylloxera*

from a large oak leaf in the course of a single night when confined to one leaf. On one occasion one of the crickets ate two saw-flies which had emerged in the jar; I am not positive that it killed them, but it certainly devoured all the softer parts of the body. I have also had them feed upon various kinds of small leaf-hoppers and tingids, and am convinced that they are thoroughly and constantly carnivorous and therefore a valuable ally in reducing the numbers of our smaller insects.

LIFE HISTORY OF ONE OF THE CORN BILL-BUGS.

(*Sphenophorus ochreus* Lec.).

By F. M. Webster.

Although its method of attack is somewhat unlike, this insect is closely allied to the species figured in Vol. I, p. 186, of Insect Life, and there described as destroying sugar-cane in the Sandwich Islands.

While by no means rare, and diffused over the country from Canada to Arizona, the species under discussion has but recently come to the front as a destructive insect, the first published notice of its depredations appearing in the monthly report of the Illinois State Board of Agriculture for June, 1888. It was there accused of puncturing the stems of young corn, and feeding on the tender folded leaves in the center of the plant, near the surface of the ground, its depredations being confined to fields planted on newly-drained swamp lands, which had previously been grown up with rushes (*Scirpus*) and reeds (*Phragmites*), its supposed food plants.

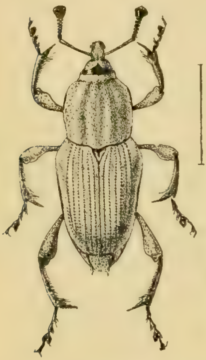

Fig. 20.—*Sphenophorus ochreus*: *a*, larva; *b*, adult—enlarged (original).

There is the best of evidence that this pest has for several years been working serious injury to the corn crop planted on recently-drained swamp lands in Indiana, hundreds of acres being thus destroyed. Until quite recently, however, I have not been able to work up the matter thoroughly enough to get an insight into the life history of the depredator, and though there are yet a few minor points lacking, still I am able to give its probable habits during the entire year.

The insect passes the winter in the adult stage, coming forth from its hiding places in spring, and feeding upon the tender portion of the stems

of reeds and rushes, and later on the same parts of the young corn plants, if the field has been planted to that grain. Late in May and early in June the female burrows down into the earth and deposits her eggs in or about the bulbous roots of *Scirpus*, the roots of this plant consisting of bulbs connected by smaller slender roots. The larvæ burrow in these bulbs, which are many of them the size of an ordinary hen's egg and very hard, and transform to the adult beetle therein, appearing on the rushes, reeds, or corn in August and September, and feeding after the manner of their ancestors. The large size of the larvæ and the diminutive size of the corn at the period of oviposition, renders it very unlikely that this species will ever breed in the roots of corn, and, indeed, no trouble has been experienced after the natural flora of the land has been eradicated.

FIG. 21.—Work of *Sphenophorus ochreus* in roots of *Scirpus*—natural size (original).

At the commencement of my investigation, and after learning the habits of the larvæ, it looked as though breaking the ground in June or July and throwing roots and larvæ up to the scorching rays of a midsummer sun might destroy the pest. But having reared adults from the egg in bulbs kept in dry earth from the middle of June until the 25th of August, it would seem that little can be accomplished in that direction, and the only plan which now promises success, is to destroy all trace of their native food plants long enough before planting to corn to starve the adults, or compel them to seek other uncultivated localities. A field of 75 acres, in the vicinity of La Fayette, which was nearly a total loss this season, is being fall-plowed, and the result will be seen another year.

The egg I have not been able to identify with certainty, except as dissected from the ovaries of the female, but it is in all probability quite large, elongate, and white.

The larva is white with brown head, the latter small, the body becoming very robust posteriorly, so much so that it appears to be fully two-thirds as broad as long, and very much wrinkled. Feet wanting.

The adult is black beneath but varying in color above from pale ochreous to plumbeous and cinereous. The size varies from less than one-half to nearly three-fourths of an inch in length.

In some instances I find that the work of these snout beetles has been confused by unentomological farmers with that of a cut-worm which eats into the young corn a short distance above the roots and then works upwards in the stem, after the manner of *Gortyna nitela*,

above ground. This last depredates on corn in newly-broken lands, both of native and timothy sod; but I have failed to find them in blue-grass sod. The worm is the larva of *Hadena stipata* Morr, a species not previously known to injure corn. Their method of work is such that an attacked plant never recovers, and one worm may destroy a whole hill of corn, going from one plant to another without coming to the surface. Larvæ continued to work up to the 1st of July, and the moths appeared about the 25th of that month. Serious damage has been reported in various parts of the State, specimens accompanying the complaints. I found them the most abundant in low, recently-drained, and newly-broken lands.

THE NEW ZEALAND KATIPO.

By R. Allan Wight, Auckland, New Zealand.

The Maori name of this spider is "*Katipo*," the proper name, *Latrodectus scelio* and it belongs to the family Theridiidæ. All old colonists, natives, and scientific men in New Zealand are agreed that it is dangerously poisonous. The poison is of an extraordinarily virulent nature, and fatal cases are not wanting. The habitat of this spider is strictly confined to the sea-shore. There are no other poisonous spiders known in New Zealand. Mr. A. T. Urquhart, who is a very old colonist, and our best arachnologist, says that there are species of Agalenidæ and Tegenaria, which inhabit gardens and old houses, but they have no resemblance to the Katipo. The only way to account for Mr. Taylor's statement that there are two species of Katipo is by supposing he must have taken the male and female for distinct species, and that by the term "red spider" he must have meant "spider with a red spot."

As for the mistake Dr. Wright makes in saying that there is an inland species that inhabits gardens and spins a "slight web," it is easily accounted for. Before Dr. Wright came to New Zealand the natives were more industrious (*i. e.*, they had more slaves), and they used to convey many canoe loads of sea-shells and sand far inland to form beds for the *Kumera*, or sweet potato. When I first saw these beds in deserted gardens, I was told the sea had left them there, but geological reasons did not bear the idea out, and I soon found the natives had transported them for the *Kumera* beds. My further doubts, as to whether the mollusk had been brought in them, for manure, were settled by the presence of the Katipo, which was proof of the shells having been dry and brought from above high-water mark. In these days before the Pheasant and some other birds were imported, the coast was full of the spiders, the natives used to burn the grass before sleeping on it, and when they removed the shells, large numbers of spiders were transported with them. This accounts for the majority of cases of persons bitten by Katipoes being native women and old women, because the work of the *Kumera* beds generally falls to them. And moreover the most fatal cases are in

summer, because at that season the old women are constantly engaged picking off the larvæ of the Bind-weed Hawk-moth (*Sphinx convolvuli*). Removed from the shore the Katipo seems even more venomous than in its native habitat, and the Maories will burn down a house and all that is in it where a person has been bitten, if they do not find the spider, sooner than let it escape, because they think that upon this depends the recovery of the sufferer. As for the "thin web," the spiders on the beach weave the same web, and even those packed by me for Washington had done so before the box as fastened down and they were captured on the sea-shore.

The poison is generally treated as a narcotic, with stimu.ants, but it seems peculiar that no one ever seems to press a ring over the fresh-made wound to keep the poison from spreading. To give some idea of the effects and nature of the poison, I will condense a few cases out of a great many kindly sent to me, for some of the best of which I have to thank Mr. Urquhart, and, to save repetition, I may as well say that I select only those upon reliable evidence, and where the sufferer was in good health and condition at the time. also where the Katipo was recognized.

Mr. King, of Waimate: Bitten in the leg; violent pain; considerable swelling and inflammation; treatment, hot vinegar; lasted three hours; imputes cure to having been driven into great and sudden excitement from other causes.

The Rev. Mr. Mathews: Bitten on the shoulder; great pain; punctured wound; slight swelling; inflamed 3 inches around: had to walk sharply for 20 miles; dull, heavy pain for three days.

Archdeacon Clarke and party: Bitten by a brood of very young Katipoes; great irritation for some hours.

Captain Burleigh: Twice bitten, arm and shoulder· great irritation and rash *on neck and head* for some hours.

Dr. Shortland, one of our oldest and most esteemed settlers. gives cases as far back as 1842, from which I select.

Particularly powerful, healthy young man, bitten on the leg, brought in dying condition; wound like that of a large flea; intense pains all over the body for twelve hours, then violent pains in the soles of the feet; in violent perspiration all the time; all the body covered with a rash like the measles; skin all came off; ammonia injected into the wound; large dose of brandy; duration of illness not given.

Another case: Wound "like the bite of a sand-fly," intense cold and shivering for three days; great difficulty in keeping up the pulse; violent "pins and needles" all over the body; profuse perspiration; swelling not great; violent pains lasted a week; weak and depressed for "a long time after."

Case of a Maori woman bitten on the thigh whilst tending *Kumera* beds: No better means being at hand sweet oil used and recovered in three days; at first seemed to be dying.

Dr. Shortland adds that he has often placed Katipoes on his hand, of both sexes and all ages, and never was bitten, from which he infers that they do not bite unless hurt. There is a case given by Dr. Trimnell, on the authority of the resident magistrate of Nelson (Mr. Bishop), of the death of a child. The fact is beyond doubt, but the particulars are not given.

The Rev. Mr. Meek gives a very circumstantial accou of his son's case, and, as it is a curious one, I may here state that the reverend gentleman's word is beyond doubt. Dr. Mohbeer was also in attendance. It must be severely condensed. Bite on shoulder, "excruciating" pain; pain found its way down to the groins, then up the spine and into arms and chest; moaned with pain day and night; patient very strong and healthy young man. "I never saw any one in such agony in all my life"; veins very much swelled; wound punctured, ammonia injected, turnip poultice applied; "when removed, quantity of black matter exuded; when legs rubbed, quantity of inky-black fluid emitted;" severe pains lasted three or four days; depression not over after a month; treated with frequent doses of brandy.

Mr. Meek adds that fatal cases are frequent amongst the natives in his district. Besides these I have many other similar cases, and amongst those that have not been published otherwise are one of a girl and one of an old man suffering severely, much in the same way; ammonia and spirits were used and recovery took place in about a week. One case of a boy is recorded who did not recover for *many months*, and never perfectly. Several there are of women bitten in the legs and abdomen, seized with cold and shivering and suffering great pains generally for three or four days, and then taking a month to recover, and there is one of a woman which proved fatal, and another of another woman who, brought in apparently dying, was taken with the usual symptoms of narcotic poisoning, but who recovered, although treated with nothing but doses of *laudanum*. I must say, however, that from my knowledge of natives, some of the primary symptoms are not improbably caused by intense fear, as they have a terrible dread of the Katipo; but this observation would not apply to the white man.

A CATERPILLAR DAMAGING THE CORK-TREE.

We learn in a roundabout way (through the Consular Report of the Province of Victoria) that the cork-tree in the Province of Cataluna, District of Gerona, Spain, has recently been suffering from the attacks of an undetermined larva, which in a few days strips a tree of its leaves, giving it the appearance of having been burnt. The caterpillar first made its appearance in the woods of Llagostera in 1886, and has rapidly increased in numbers. It is described as being of the size of the silk worm, of a dark gray color, and covered with down, and to produce "small white butterflies."

ANOTHER STRAWBERRY SAW-FLY.*

Monostegia ignota (Nor.).†

By F. W. MALLEY, Champaign, Ills.

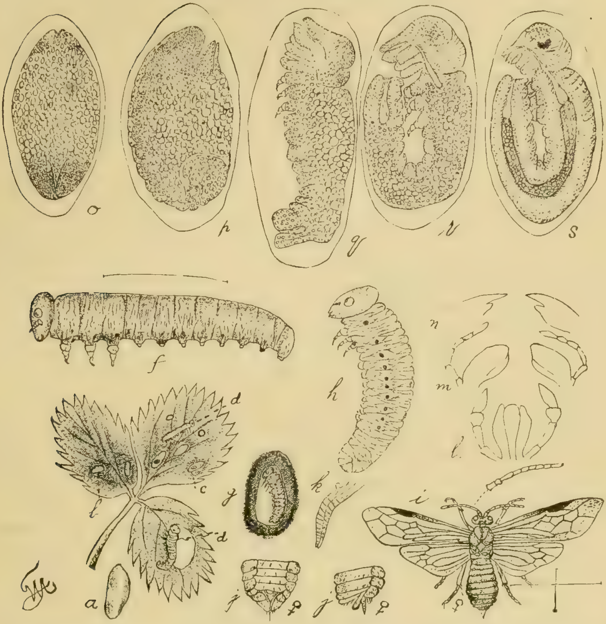

FIG. 22.—MONOSTEGIA IGNOTA: *a*, egg; *b*, blisters containing eggs; *c*, blisters from which larvæ have issued; *d, d*, young larvæ; *f*, full grown larva; *g*, cocoon containing larva (natural size); *h*, shows *g* enlarged; *i*, adult female, *j j*, ventral and lateral view of abdomen of female; *k*, saw; *l*, labium and labial palpi; *m*, maxillæ and maxillary palpi; *n*, mandibles; *o*, ventral view of embryo after segmentation; *p*, embryo, lateral view, ventral surface outermost; *q*, embryo, lateral view, ventral surface curving inward; *r*, embryo, lateral view, ventral surface doubled upon itself, and showing beginnings of alimentary canal; *s*, embryo, showing alimentary canal completed, eyespots, muscles of mouth-parts, &c. (Drawn by the author.)

The adults of this species are black four-winged saw flies (*Tenthredinidæ*), about .28 inch long. By displacing the wings, characteristic dull whitish spots are seen on the back of the abdomen. However, the

* This article is a brief extract, giving the more important results of the study of the above-named species, and included in a Thesis prepared for the degree of Master of Science at the Iowa Agricultural College, Ames, Iowa.

† *Selandria ignota* (Nor.). Trans Am. Ent. Soc., I, page 257.
Monostegia ignota (Nor.). Cresson's Synopsis N. Am. Hymen., page 162.

casual observer who depends on this character alone is liable to be misled, as there is another species of saw-fly *Harpiphorus maculatus* (Nor.)‡ closely resembling it, and having similar markings on the back of the abdomen. The most certain method of distinguishing the two species is to note the number of submarginal cells in the fore wings, *M. ignota* having four, and *H. maculatus* only three.

The larvæ of *M. ignota* have infested the strawberry beds on the college grounds for several years, feeding on the leaves, and would, if numerous enough, threaten the crop. This has not been the case here, but reports from other parts of the State say that "the worms are simply ruining our plants." Drawings of this species in all its stages are given in Fig. 22.

Adult saw-flies of this new strawberry pest were found depositing eggs from the 1st to 25th of April, the period of greatest deposition being from the 10th to 20th. Adult females were captured, confined, and eggs obtained that have furnished larvæ which have been carried through all the larval stages and their habits studied in connection with observations in the field. The eggs are deposited singly on the under side of the leaf, just beneath the epidermis. In no case were the eggs found deposited in the petiole of the leaf as is said to be the habit in *H. maculatus*, but frequently alongside or in the angle between two veins; seldom more than three or four eggs are found deposited in a single leaflet.

When first deposited the eggs (Fig. 22*a*) are pure white, tapering towards both ends, one side slightly concave, the other quite convex; are .475^{mm} wide by .875^{mm} long. The point of deposition can hardly be seen at first, but the swelling of the eggs, due to the developing embryo, causes light-colored blisters of 0.5–.75 by .75–1^{mm} in size. During embryonic development the transverse diameter of the egg is doubled or trebled, lengthens about one diameter but does not thicken much. In Fig. 22 are shown a few of the more important changes taking place during the embryonic growth of the larvæ. Its embryology has been traced in detail, but only a suggestive outline can here be given.

First. Segmentation of the yolk and partial differentiation of the anterior and posterior embryo lobes. Fig. 22*o*.

Second. Division of the anterior lobes and the differentiation of the ventral surface which at this stage occupies the outer circumference.

Third. The folding of the embryo upon its ventral surface and the differentiation of the two lower anterior lobes. Fig. 22*r*.

Fourth. Beginnings of the alimentary canal; anteriorly, the œsophagus; posteriorly, the rectum and colon. Fig. 22*r*.

Fifth. Continued development, forming the remainder of the alimentary canal; appearance of the eye-spots and muscles of the head and mouth parts. Fig. 22*s*.

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‡ *Emphytus maculatus* (Nor.). Bost. Proc., VIII, 1861, pages 157, 158. Trans. Am. Ent. Soc., I, page 232.

Harpiphorus maculatus (Nor.). Cresson's Synopsis N. Am. Hymen., page 160.

Sixth. Division of the outer wall into distinct segments and hatching of the embryo.

When ready to issue the young larvæ eat a small hole through the inclosing epidermis and emerge. At first they are slender 22-footed slugs; bodies white, translucent, much wrinkled; granular; 2–2.3^{mm} long; upper part of the head cream colored; claws of the pectoral legs eyes, labrum, mandibles, brown; remaining mouth parts, whitish brown; ring around the eyes black. The young worms begin their ravages at once, eating small holes through the leaves. After feeding six or seven days they pass through the first molt, are about one-half larger, the dorsal and lateral surfaces yellowish green, ventral surface pale. At each of the three succeeding molts, all of which occur within the next eight or ten days, the color is of a deeper green. The larvæ when full grown are between .55 and .65 inch long. Head and mouth parts, claws, and first joints of the pectoral legs are of a more distinct brown; body a beautiful deep green, much wrinkled, with one dorsal and two lateral obscure blackish stripes. Anterior segments but slightly larger than the posterior ones.

By the 1st of May the worms begin maturing and entering the earth, and by about the 1st of June all have entered the ground. Entering the earth to the depth of an inch or so, a frail earthen cocoon is formed, on the inside of which there is a thin silken lining. Larvæ in cocoons formed May 1 have shrunk to one-half of their original length, but up to date (August 22) have not pupated. The shrunken larvæ still retain their green color, but the stripes are more distinct, due no doubt to the fact that they have been crowded into about one-half their original length.

As yet no second brood has been obtained. However, if the larvæ should pupate and issue any time in August or forepart of September there would yet be time enough for oviposition, hatching of eggs, and maturing of larvæ before frost would interfere. This question will soon be determined, and, indeed, will prove to be an interesting one, since there has been much confusion and controversy as to the number of broods of the old pest, *H. maculatus*. It seems barely possible that the two species have infested the same beds and have been confused with each other in some of the observations made. It is hoped that, with our present knowledge of the species, a further study of them in their respective localities will determine questionable points. In this locality there is slight evidence that both species are present. The evidence is very slight, however, in that no adults of *H. maculatus* were captured, and but one immature larva in one hundred alcoholic specimens bears the unmistakable markings on the head which characterize the larvæ of that species. (See Fig. 23 for comparison of the heads of the larvæ of *M. ignota* and *H. maculatus*.)

Numerous specimens of the adults of *M. ignota* were examined, neuration of the wings especially noted, and no variation found. Some slight varia-

tion in the size of adults and depth of coloring of the legs was discovered. It was also found that the description of *Monostegia obscurata* Cress. applied very closely, and accordingly specimens of adults were sent to Mr. E. T. Cresson, Philadelphia, Pa., for comparison and determination. His reply was that "your specimens seem to agree with *Selandria ignota* Nor. As to *S. obscurata*, I think on an examination of more abundant material it will prove to be the same as *ignota*." Also, "I would not like to say that your *Selandria* is a new species without an examination of a larger series of *ignota* than we have in our collection." Hence the best that can be done at present is to say that the species is *Monostegia ignota* (Nor.).

FIG. 23.—*a*, head of larva of *Monostegia ignota* (Nor.); *l* and *c*, front and side view of head of *Harpiphorus maculatus*. (Drawn by the author.)

As to the geographical distribution of this species, little can be said just now. Among the specimens from which Norton described *M. ignota* was one from Illinois, and *M. obscurata* was described by Cresson from material collected in Colorado.

The period of greatest abundance of the worms is from about the 25th of April to 5th of May, though they begin appearing about the middle of April. Hence most of the worms have hatched before the vines are well in bloom, feed, mature, and again disappear by the last of May, before much fruit has ripened. It will therefore be perfectly safe to apply any of the arsenical poisons, with great efficiency, as early as April 20 to 25, and with comparative safety about the 1st of May.

Of the insect enemies preying upon the worms, *Coriscus ferus* was found to be very beneficial indeed. No parasites have as yet been reared.

In conclusion, I could not honorably fail to give due credit to and acknowledge the needed guidance and instruction of my kind and worthy instructor, Prof. Herbert Osborn, without whose suggestions and friendly criticisms of the work while in progress it must have been less accurate and complete. To Prof. F. M. Webster for "genuine *H. maculatus* larvæ," and to Mr. E. T. Cresson for determination of specimens sent him, I wish to tender my sincere thanks.

PACIFIC COAST WORK OF THE DIVISION OF ENTOMOLOGY.*

By Prof. W. A. HENRY, Madison, Wis.

Several days were spent in company with Mr Coquillett, of Los Angeles, in visiting fruit farms at various points in that vicinity and noting the destructive effects of the white scale and red scale, and the efforts in progress to check their ravages. At Orange, in Orange County, the destruction of citrus trees by the red scale has been great, and only a few more years would suffice to leave that section without any such trees if remedies to check the destruction had not been put in operation the present season. The Santa Anna vine disease has destroyed most of the grape-vines, and every orange orchard shows in a greater or less degree the attacks from the red scale. Every stage from thriftness to death itself was noted. In some orchards only the yellow-spotted character of the leaves showed the presence of the scale just beginning its fatal work; in others the ends of the branches were leafless and dead, the interior portions of the top yet carrying leaves, though little or no fruit. Still other orchards had but the stumps of the orange trees left, all of the limbs to the size of one's arm having been killed by the scale and removed with the saw. From these stumps green shoots showed signs of life, and if care was given promised to renew the value of the orchard. The careless treatment of the land showed as plainly as the trees themselves the discouragement of the people.

Usually an orange orchard in southern California receives the best of care, and the carefully-tilled soil lying loose without a weed in sight and as level as a floor delights the lover of thrift and good tillage. In many orchards weeds cover the ground and form thickets 5 or 6 feet high, so dense that a man can hardly get through them. The dead and dying orange trees among these weeds stand like monuments marking the deadly march of the insidious, insignificant, but wonderfully fatal scale. In company with Mr. Hamilton we visited the orchard in which Mr. Coquillett was conducting spraying experiments with resin-soap solutions. I will refer to these experiments again later on. We also visited many other groves in all stages of thrift and decay, from those bearing heavy crops to those with nothing but the stumps standing. It was very apparent that those who had fought this scale the most vigorously, even though very imperfectly heretofore, are coming out the best in the end, and that those who early gave up and neglected their orchards will suffer far the most heavily. One orchard near the California Central Railroad station, at Orange, of 850 seedling trees, showed the ends of the branches already dead, and there were scales enough on the leaves to so reduce the vitality of the trees the present season that

*Extracted from a report submitted to the Secretary of Agriculture (see the special notes in this number, p. 125).

by next spring most of the trees would have to be cut back to mere stumps. A few weeks before our visit the owner plucked up courage and sprayed the trees with the resin-soap compound in a very thorough and systematic manner, the whole operation costing for the 850 trees $200. We spent an hour in observing the effects of the wash, and estimated that more than 95 per cent. of the scale had been destroyed, while not one leaf in ten thousand had been injured in the least by the wash. Mr. Hamilton informed us that resin was now being brought to Orange by the car-load for the purpose of making the resin soap. For the first time people are really taking heart, and were going at their orchards in dead earnest to make them profitable once more. The plow had been set to work to reduce the weeds and bring back the old-time thrift in many cases, though some orchards were yet as desolate as ever. Before speaking further in regard to remedies for the red scale, the destruction of the cottony-cushion scale should be noted.

In studying this insect we first visited the place of Mr. William Niles, in Los Angeles, where the "lady-bug" (*Vedalia cardinalis*) was being propagated by the county insect commission for dissemination among the orange groves infested with the cottony cushion or white scale. We found five orange trees standing about 18 feet high inclosed by walls of cheap muslin supported by a light frame-work of wood. The orange trees inside this canvas covering had originally been covered with the white scale, but the Vedalia which had been placed on these trees were rapidly consuming the last of the pests. Entering one of these canvas houses we found the Vedalia, both larvæ and adults, busy consuming the scale; here and there on the canvas were the beetles endeavoring to escape to other trees. These insectaries were in charge of Mr. Kircheval, one of the county insect commissioners, who kept a record of the distribution of the beetle. It was indeed a most interesting sight to see the people come, singly and in groupes, with pill-boxes, spool-cotton boxes, or some sort of receptacle in which to place the Vedalias. On application they were allowed within the insectaries and each was permitted to help himself to the beetles, which were placed in the boxes and carried away to be placed on trees and vines infested by the white scale at their homes. Mr. Kircheval kept a record of the parties and the number of beetles carried off. The number coming for the Vedalia was surprisingly large—scores in a day—and each secured at least a few of the helpful beetles. That the supply should hold out under such a drain was a great surprise, and speaks better than words the rapidity with which the Vedalia multiplies when there are scale insects enough to nurture the young.

We visited other points: Lamanda Park, Santa Anita, Sierra Madre Villa, Pasadena, etc. At the time of our visit to Sierra Madre Villa, August 23, the white scale had already disappeared before the Vedalia. At Santa Anita, the ranch of Mr. E. J. Baldwin, we examined a 350-acre orange orchard, in which the white scale had started a most de-

structive course. Mr. Baldwin began an equally vigorous defense, going personally into the orchard and superintending the work of fighting the white scale. There was every sign, however, that the scale was going to be the victor. Some of the trees were almost ruined by the severity of the application made. Happily, before the pest had gone far in its work, the Vedalia was heard from, and Mr. Baldwin secured a number, which were placed in the hands of one man specially detailed to look after its welfare. This individual spent six weeks in colonizing the Vedalia in various parts of the orchard. After that time a careful examination showed the superintendent that the work of colonizing was so complete that further effort in that line was unprofitable. It was predicted at the time of our visit that a few weeks more would leave the orchard entirely free from the white scale. At Chapman's we found the citrus orchard, formerly so famous, entering the death stages from the white scale, which was now fortunately being so effectually checked. At Pasadena, on the grounds of Prof. Ezra Carr, we found that some of the shrubbery had been seriously injured by the white scale, but thanks to the Vedalia, not a single pest was alive at the time of our visit. Mrs. Jennie Carr pronounced the Vedalia "a miracle in entomology."

A word in relation to the grand work of the Department in the introduction of this one predaceous insect. Without doubt it is the best stroke ever made by the Agricultural Department at Washington. Doubtless other efforts have been productive of greater good, but they were of such character that the people could not clearly see and appreciate the benefits, so that the Department did not receive the credit it deserved. Here is the finest illustration possible of the value of the Department to give people aid in time of distress. And the distress was very great indeed; of all scale pests the white scale seems the most difficult to cope with, and had no remedy been found it would probably have destroyed the citrus industry of the State, for its spreading to every grove would probably be only a matter of time. It was the Department of Agriculture at Washington which introduced the Washington navel orange into south California, and the Department has now given an effective remedy for the worst scale insect. The people will not soon forget these beneficial acts.

At Sierra Madre Villa, in the orchard of W. D. Cogswell, a chalcid fly was found to be parasitic on what is there called the red scale. In company with the county insect commissioners and Mr. Coquillett we visited this orchard. It is quite evident that the so-called red scale of this orchard has been greatly checked and may yet be entirely destroyed by the chalcid. At E. J. Baldwin's the commission also found the same scale being destroyed by the same parasite. In this case each parasite destroys but a single insect, and the commissioners were very solicitous and also skeptical as to its ability to rapidly destroy the red scale. Furthermore, they questioned whether the chalcid would destroy the true red scale, as they did not believe that the scale on the orchards

mentioned was identical with that about Orange. The Vedalia has brought the people a simple, rapid, and effective remedy for the white scale, and the commission was very solicitous lest the people should give up the use of washes for the red scale and wait for the spread of the chalcid parasite. If the parasite should multiply but slowly, which seems probable, the red scale would be enabled to spread and do great harm before overtaken. It is of the highest importance, at this time, that a constant fight against this scale should be made, and there should be no halting, even if imperfect means of holding the pest in check are only at hand.

I carefully examined the experiments conducted by Mr. Coquillett with resin washes, and consider that he has used excellent judgment in the manner in which he has conducted them. I think he plans his spraying experiments carefully and with good judgment, and carries them through with thoroughness to the end.

It seems to me of the highest importance that experiments with washes be prosecuted, and that the great advance of the last year be followed up vigorously. With the resin washes for the red scale, and the Vedalia for the white scale, the citrus industry will again move forward and people have the confidence in it of former days.

CICINDELA LIMBATA Say.

By LAWRENCE BRUNER.

Recently, while walking over the sand-hills lying to the south of the Dismal River in Thomas County, Nebr., I found a few specimens of Say's *Cicindela limbata*. This very interesting beetle is, so far as I am at present aware, confined to the sand-hill region of central and northern Nebraska. In this region it is also restricted in its distribution to certain peculiar localities.

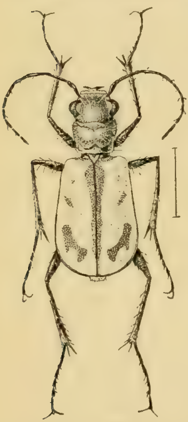


FIG. 24.—CICINDELA LIMBATA—enlarged. (Original.)

The species was first observed by me on the afternoon of the 11th of July, at about 6 o'clock p. m., while walking through a large "blow-out," two sides of which were almost perpendicular, while the others were sloping and composed entirely of loose white sand. Three of the beetles were taken, two of them *in coitu*.

The next day until 2 p. m. was spent in looking for more of them. In all two dozen specimens were taken—every one of them in "blow-outs" of a similar type to that in which the first were seen, *i. e.*, with one or more nearly perpendicular sides and in which little or no vegetation occurred.

In habits this tiger beetle resembles *Cicindela lecontei* so far as the run and flight are concerned. It is not so active an insect as some others of the sandy-soil frequenters, nor does it run or fly as quickly as they, no doubt depending more or less upon its color for protection. But little variation is noticeable in the markings of the different individuals; in fact, the few specimens taken tend to show a much more pertinent adherence to a typical pattern in this respect than is usually the case with the species of the genus. *C. lepida*, *C. formosa*, *C. venusta*, and *C. punctulata* were also taken in similar places. Of these latter the *C. lepida* alone was restricted to the bare white sands of blow-outs of considerable size, while the other three were also to be encountered away from these locations indiscriminately among the sand-hills.

The larval burrows of *limbata* are evidently placed in the somewhat solid upright banks upon the sides of the larger "blow-outs." Of these burrows none were seen that could be definitely said to belong to this beetle, although some search was made for them. Evidently the season was too early for them. My reason for thinking that the larvæ are to be found here is that the parent beetles are most frequently seen about these banks when *in coitu;* and also because the material composing the walls of these "blow-outs" is too fragile and loose at every other point save here for sustaining the burrows.

EXTRACTS FROM CORRESPONDENCE.

Injury by Xyleborus dispar in England.

The beetle which is considered one of the rarest of the British Coleoptera, the *Xyleborus dispar* Fabr. (formerly known as *Bostrichus* or *Apate*) has appeared in such great numbers in plum wood in the fruit grounds at Toddington, near Cheltenham, as to be doing very serious injury. I found on anatomizing the injured small branches that one of the galleries which the horde of beetles (packed as closely as they can be) forms or enlarges passes about two-thirds round in the wood more or less deeply beneath the bark, whilst another of the tunnels, likewise occupied with its closely-packed procession of beetles, was in possession of about 2 inches of pith, so that the rapid destructoin of the tree was fully accounted for. The attack appears, as far as I see, to disappear usually very rapidly; but I am advising burning to make sure. This disappearance I conjecture may arise from excessive rarity of the male of this species; amongst about 60 females which I extracted from the tunnels I found only one male. * * * —[Eleanor A. Ormerod, Torrington House, St. Albans, England, August 22, 1889.

Insect Pests in Colorado in 1889.

Here is a short summary of the insect pests in Colorado for 1889, so far as they have come under my notice:

There has been considerable immunity from the attacks of insects in Colorado this year, so far as I can learn. Neither *Eurycreon* nor *Caloptenus* have molested in this section, at any rate. Warble-flies (*Hypoderma bovis* DeG) have been complained of

in some parts, and *Chrysops* and *Culex* have been troublesome as usual in Wet Mountain Valley. Mr. H. G. Smith, jr., has sent *Anthomyia brassicæ* from Denver, with a note that it injured turnips; and earlier in the year the same crop at Denver was reported to suffer from the attacks of *Phyllotreta pusilla* Horn, specimens of which were sent. In Wet Mountain Valley *P. pusilla* is common, but seems to confine itself to wild plants. *Aphis brassicæ* has been complained of in some parts as injuring cabbages. *Carpocapsa pomonella* is apparently well established and destructive in southern Colorado, to judge from apples in the market, though it is not so injurious here as it has been in other parts of America.

Of Orthoptera, Mr. W. P. Lowe has sent *Diapheromera* from Pueblo County, but it seems to be rare. The sparrow-hawk does excellent service in keeping down Orthoptera. One shot on the Sangre de Cristo Range had its stomach full of what appeared to be *Camnula pellucida* var. *obiona*, and one from Pueblo County had remains of *Anabrus* in its stomach.

Musca domestica ranks as a first-class nuisance in Wet Mountain Valley, swarming in houses and getting into everything. A blow-fly (*Lucilia*) is a great pest in the earlier part of the year.

Heliothis armigera is abundant in Custer County, but apparently harmless.

Agrotis saucia is also common.

A box of crackers from Denver was found badly infested with small larvæ, almost certainly of a species of *Ephestia*.—[Theo. D. A. Cockerell, Westcliffe, Custer County, Colo., October 2, 1889.

Spraying for Black Scale in California.

* * * Since I wrote you last I have taken up the study of scale insects—not very scientifically, but in an extremely practical and disagreeable way—that is, experimenting with a solution for their destruction and the disinfecting of orchards on contract. I have already sprayed and contracted to spray over half the orchards in the country, and people have actually begun to consider me an authority on "bugs." * * * I only took up the subject with the view of clearing our own orchard, *and I did it*. There is a little satisfaction in clearing black scales off an orchard so black and covered with scales that you can scarcely see wood or leaves, and the fruit so smutty it has to be scrubbed before you can market it—and that is the condition of some of the orchards close to the sea. I have a good machine, one I built myself (I could not buy one large enough), but am not satisfied with it. I believe a small petroleum engine might be made to do the pumping cheaper and better than a man. It is a powerful force-pump, mounted on a sheet-iron tank, on a wagon, and has four sprays on the ends of 8-foot rods: so it takes six men to keep it going. * * *—[Harvey C. Stiles, Helix, San Diego County, Cal., September 26, 1889.

The Australian Ladybird in New Zealand.

I have been searching closely in places where Icerya were and where they were devoured by swarms of these beetles, and I can not find a trace of them in any stage. The specimens I brought here with me refused every scale insect I could find and every aphide, and they all died of starvation except those I turned loose, and these I can not find now. At first I thought they would eat *C. cacti*, but they merely tasted it. It is very likely these beetles came over from Australia in the ovisacs, as we import a good many trees from thence; and, if so, it would account for two things: First (as but few would come in that way), for their being so long in gaining head against their prey, and, second, for their existence in districts only, many districts having imported independently of the others. But what is occupying me just now is not being able to find what else they feed upon, and Mr. Koebele now repeats what he told me in Auckland, that he found them feeding upon Icerya and nothing else. I think you will find that Icerya will not be easily eradicated altogether, and will

occasionally break out again in places, and if these beetles, whose extraordinary rapacity can not long be supported by Icerya, can eat nothing else, they must die out, and then the pest will again gain head. I would, therefore, take great care of your Lestophonus, which, although slow, is sure, and has done untold good in Australia, besides having the advantage of living upon other hosts. These, together with your own native parasites, may yet be of great service to you, and quite able to keep Icerya in check after the beetle has reduced it to a minimum.—[R. Allan Wight, Te Komata, Paeroa, Auckland, New Zealand.

A Museum Pest attacking Horn Spoons.

I mail you to-day an insect which is destroying our horn scoops, spoons, combs, etc., in the drug store. I also inclose a piece of horn scoop upon which the insect has been feeding. Will you be so kind as to inform me what the insect is, by what means to get rid of it, etc.? * * * —[J. P. Brashears, Fort Worth, Tex., October 3, 1889.

REPLY.— * * * The insect in question is *Anthrenus varius*, one of the common museum pests. This insect feeds upon almost any dry animal substance, museums being especially subject to its attacks. It has also been reported as feeding on whalebone. Bisulphide of carbon will destroy it in all stages, and if your goods are in a comparatively tight show-case or box, this substance can be used easily and with good results. The odor of camphor or naphthaline will probably prevent their attacking non-infested material, and these substances are, especially the latter, constantly being employed in museums for this purpose.—[October 9, 1889.]

Some Notes from England.

C. destructor has certainly spread over a more extended area this year, so far as can be judged by reports, and I only note those (except from qualified observers) that are accompanied by corroborative specimens. But, withal, the injury does not seem (excepting in the case of one field) to be of importance.

Specimens of what I think may prove to be attack of *Diplosis equestris* Wagner, have been sent me, but the very peculiar "saddle-like" growths consequent on the larval injuries were on barley stems *not* wheat, so until we make some advance or rear the imago I can not feel sure that we have the true "Sattlemarke."

The *Pulvinaria ribesiæ* Signoret, is a newly observed trouble to *Ribes* in this country so far as identification goes, but appears to have been here in one, possibly two localities for a few years. * * *—[Eleanor A. Ormerod, St. Albans, England, September, 1889.

A Note on the Lady-bird Parasite.

To-day while re-reading some of the articles which appeared in "*Insect Life*" (Vol. I), I was interested in the one on page 101 *et seq.*, entitled "A Lady-bird Parasite," as it called to mind a similar observation made by me in 1885. During a part of that year I assisted Professor Forbes, and transmitted to him in my report in substance the following: "May 29: Attached to the underside of a clover leaf was observed a small cocoon, possibly one-fourth of an inch long. Upon this cocoon a Lady-bird (*Megilla maculata* De G.) was found apparently watching the cocoon. The beetle remained in the same position until death came to her relief a day or two after the imago appeared, which occurred June 5." As this was the same beetle observed by you, and as your illustration represents the appearance exactly as observed by me I presume that the observations were parallel, though I did not carefully study the parasite, having only a very poor microscope.—[F. W. Goding, Rutland, Ill., October 10, 1889.

Nezara puncturing Bean Buds.

Yours received relating to the insect described as *Nezara hilaris*. I have closely observed the habits of it since, and think I can not be mistaken when I say that this particular insect has abandoned its predatory habits and taken to a vegetable diet.

I send herewith another batch, thinking you will be able to tell by dissecting that he is filled with the juices of the bean; you can distinctly smell the bean odor. In addition you will discover a sucker, which he keeps closed against his under body. In his operation of feeding he lowers it with an apparent joint like the elbow; this is straightened as it is inserted into either the base of the bean flower or into the tender pods. While working on the young buds or flowers he goes from one to another, not satisfying himself until he has exhausted a good many; he seems very greedy. * * *—[George G. Curtiss, Brooks, Stafford County, Va., September 30, 1889.

REPLY.—* * * The insect in question is a common plant bug, probably *Nezara hilaris*. The species can not be certainly determined in the absence of adult specimens. This insect is ordinarily predaceous and feeds on other insects, but it is also known to feed on the juices of plants. It has been found puncturing the pods of the Trumpet Creeper in a manner very similar to your description of its work on bean pods. It may, therefore, be a question whether the damage it thus causes to plants is not greater than the benefit derived from its feeding on and destroying the larvæ of other insects. An application of kerosene emulsion will probably be effective against it.—[October 1, 1889.]

Beetles in a Pin-cushion.

I send you by mail a sample of the bugs found in the pin-cushion at Phenix. The facts were as stated in the paper which you read. The bug is one of the smallest, but the only one which I could get.—[D. O. King, M. D., Pontiac, R. I., July 8, 1889, to H. R. Storer, M. D., Newport, R. I.

"In the Phenix House a guest was entertained the other night who in the morning averred that the room he occupied was haunted. This he told the host, who made a cursory answer. But the guest went on to explain how the haunts and bogies plagued him. He said they were scratching their hands over everything around the dressing-case, and kept him awake the greater part of the night. The host and hostess went to investigate. Sure enough, there was the scratching, sharp noise, without ceasing. It seemed to come from a large toilet cushion on the dressing-case, but there was not a break or crack in its satin covering. So certainly did the noise proceed from the interior of the cushion that it was ripped open, and from its inner covering of cotton cloth the filling was shaken. It was filled with coarse shorts, such as used in stables for feed, and from this tumbled and rolled dozens of black bugs, known as 'snapping bugs' of an inch long. These were what had made the scratching noises as they crawled about against the lining of the cushion. The cushion had been made about four years ago, and as it had never been opened the insects must have germinated in the grain."—[*Providence Journal*, July 3, 1889.

The inclosed history, with specimens (living), may interest you. I was sufficiently amused by the newspaper jotting to request my friend, Dr. King, of Warwick, who lives in the locality indicated, to look the matter up. He seemed to think, with the people in question, that the case was one of prolonged gestation and artificial delivery, while I am inclined to think that there must have been some minute opening in the cushion which escaped notice.—[H. R. Storer, president Newport Natural History Society, Newport, R. I., July 12, 1889.

REPLY.—The specimen which you send is the adult beetle of the common meal-worm (*Tenebrio molitor*). The story as given in the newspaper clipping is not unreasonable and the shorts used as filling for the pin-cushion may have contained the eggs of the beetle when the cushion was originally made. The larvæ developed in the shorts and transformed to beetles, and there is no reason why several generations might not have lived in the cushion, providing there was sufficient food.—[July 19, 1889.]

Texan Digger Wasp.

I send you to-day box with specimens by mail. One of them is a large insect of, I presume, the Hornet species which I received in a damaged condition.—[J. F. Wielandy, Springer, N. Mex., September 26, 1889.

Reply.— * * * The specimens last sent are the large Texan Digger Wasp or Hornet (*Pepsis formosa*), one of the largest and most showy of the fossorial or sand wasps. It is commonly known as the Tarantula-killer and is reported to attack that enormous spider, *Mygale hentzii*, stinging it and inserting an egg in its body, after which the spider is introduced into a hole or nest in the sand some 5 inches deep. The wasps emerge in June and are common until Fall. It is a southwestern species but occurs as far north and east as central Kansas at least. There is a full illustrated account of it in Vol. I of the old *American Entomologist*. * * *.—[October 2, 1889.]

Abundance of Datana angusii.

I wish to call the attention of the Department to a new and very destructive species of caterpillar—at least new to us. As nearly as I can ascertain, this caterpillar made its appearance here about three years ago, but perhaps longer. It prefers for its abode hickory and walnut shade trees in pasture fields, meadows, and grain fields; and I believe also apple trees. When they have once taken possession of a tree they never quit it so long as the semblance of a green leaf remains upon that tree. They leave not a skeleton leaf, as does the well-known orchard caterpillar. The petiole and a portion of the axis or midvein is all that remains to show that a leaf once existed there, whether simple or compound. I have been observing this pest with a view to ascertain some of its characteristics and habits, and experimenting as to the most effective means for its destruction. It is distinct from the web caterpillar, in that it is large and more voracious. It does not spin a web, nor does it draw the leaves together, but devours them bodily, net, veins, and all, except as above stated, the petiole and the heavier portion of the axis.

General Appearance.—In color it is dark purple, with four well marked white lines on each side; the lowest being the heaviest, and the second from below being lightest, while the two uppermost lines are of about uniform size, and about half as wide as the lowest. Its head is black, and armed with powerful mandibles. It is partially covered with thin rows of white hair.

Size when full grown.—When full grown it is probably 6 centimeters in length and 6 millimeters in diameter. Its body is now a little darker and its hair a little longer and whiter than in the young of 2 centimeters length.

Habits observed in feeding and Manner of Repose.—These caterpillars travel up the tree from the ground, single file, each one leaving a thread behind it, which every other carefully follows doing likewise until all camp upon the same leaf until it is literally covered, and which they do not leave until there remains only a melancholy ruin, not having the semblance of a leaf, when they turn and follow back the thread to a point a foot or often several feet above the ground, where they pile upon each other like bees for repose, to the number of many thousands, and the bulk of a pint or more. They hold fast by the middle, turning the two extremities out. Several such bunches are often seen upon the body of the same tree. Just beneath the limb as it leaves the trunk of the tree is a favorite resting place of these very peculiar organisms. When the leaves of one branch are devoured (and they usually select the lowest branches first), one of them strikes out in a new direction, laying his thread, which all the rest follow till they arrive in pastures new upon another branch; and so they go from branch to branch till not the semblance of a green leaf remains upon the tree. They have now completed their work—verified the teaching of Malthus. They retire to their camps for repose, where they perish for lack of more leaves to devour. Here their remains are bound together by an almost imperceptible fiber or thread, and are not dislodged by the peltings of hail or by winter storms. The crops of several years past are distinctly seen upon the trunks of the trees they have stripped of their foliage and of their glory.

These caterpillars are rapidly increasing in numbers. In an adjoining county an entire orchard is reported as destitute of leaves as in midwinter. I have seen no account of this new pest; probably it has not been reported. I have never seen this

caterpillar elsewhere, and not here till this year. It travels from one tree to another; some trees in the same field may escape for several years, but they will reach every tree in time.

Means applied for its Destruction.—Coal oil is promptly fatal to this pest. A few drops poured onto some of these colonies is speedily fatal, especially if ignited. But this is a very slow means of destruction and dangerous to the life of the tree. I will try carbolic acid as less injurious to the tree.—[A. D. Binkard, Peru, Miami County, Ind., July 23, 1889.]

REPLY.— * * * The insect is one of the rarer of the forest caterpillars, and it consequently has been given no common name. Its scientific designation is *Datana angusii.* The caterpillar has long been known to us, and has been reared to the imago. It is a rather large, brown moth inconspicuously marked. The facts which you give concerning its extraordinary abundance with you are very interesting, and unless you have objections we shall be glad to publish a note on the subject. From your account these caterpillars will be very easy to kill by spraying with an arsenical mixture.—[August 12, 1889.]

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX, WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By LORD WALSINGHAM.

[*Continued from page* 120 *of Vol. II.*]

CRYPTOLECHIA Z. AND ITS ALLIES.

The following tabulation may enable students more easily to assort and recognize the species belonging to the genera noticed in this paper. It must be taken to apply especially to the North American forms as it is obvious that in dealing with a more extended geographical series many other divisions and subdivisions would be required.

A. Veins 7 and 8 of the fore-wings from a common stem; 6 and 7 of the hind-wings separate and parallel.
   1. Veins 2 and 3 of the fore-wings adjacent at origin, =*Cryptolechia* Z.
   2. Veins 2 and 3 of the fore-wings remote at origin.=*Machimia* Clem.

B. Veins 7 and 8 of the fore-wings separate; 6 and 7 of the hind-wings from a common stem.
   1. Veins 2 and 3 of the fore-wings separate, =*Stenoma* Z., and *Menesta* Clem.
   2. Veins 2 and 3 of the fore-wings from a point or from a common stem; 4 very close, =*Ide* Chamb.

CRYPTOLECHIA Z.

=*Psilocorsis,* Clem.
=*Hagno*, Chamb.

Chambers (Bull. U. S. G. G. Surv., IV, 84) rightly places his genus *Hagno* (equivalent to *Psilocorsis*, Clem.) in a section of the genus *Cryptolechia.* It is indeed similar in neuration, palpi, and antennæ to *Cryptolechia straminella*, a South African species described by Zeller (Handl. Kong. Svensk. Ak., 1852, 107), as the type of the genus then created. Zeller subsequently (Hor. Soc. Ent. Ross., XIII, 259) removed *straminella* to *Machimia*, adopting Clemens' genus for a large section of the then extended genus *Cryptolechia*, but *straminella* differs from *Machimia tentoriferella* Clem. in the proximity of veins 2 and 3 of the fore-wings, as in the case of *Psilocorsis*, which was distinctly pointed out by Clemens (Proc. Ac. Nat. Sc., Phil., XII, 212). Thus if we retain the name *Cryptolechia* for the original type *straminella*, and those species which corres-

pond to it, *Psilocorsis* must be dropped as a synonym and *Machimia* be retained for *entoriferella* Clem., and others in which vein 2 of the fore-wings is remote from vein 3.

Cryptolechia quercicella Clem.

Psilocorsis quercicella Clem.
=*Depressaria cryptolechiella* Chamb.
=*Cryptolechia cressonella* Chamb.
=*Hagno faginella* Chamb.
=*Psilocorsis dubitatella* Z.

Chambers himself (Bull. U. S. G. G. Surv., IV, 86) recognized the probability that the first four of these forms would turn out to be varieties of one species, although a specimen of his *C. cressonella* was sent for comparison with Clemens' type, at Philadelphia, with the following result: "Mr. Cresson informs me that it is not *Psilocorsis quercicella* Clem., which differs by having a rather broad, distinct, dusky border on the apical margin of the anterior wings, otherwise they look very similar." A good, fresh specimen has the dusky border plain and visible, a worn specimen scarcely shows it, but so far as I have seen, variation alone is sufficient to account for Mr. Cresson's opinion.

Specimens received from Miss Murtfeldt (presumably the same as those referred to by Chambers, (l. c.,p. 84), as having been bred by Miss Murtfeldt and Professor Riley, in Missouri from *Ambrosia*, and compared with the Texan specimen sent to Mr. Cresson), are now before me and are undoubtedly Clemens' species *quercicella*, corresponding with my specimen compared with his type in the collection of the American Entomological Society at Philadelphia. Chambers (l. c., 85-86) thinks a specimen identified by Zeller as *quercicella* Clem. must be his *cressonella*. Zeller's specimen labelled "quercicella" is in my cabinet, but it is not rightly identified; it is a dark form, not separable from *reflexella* Clem.

I have seen the type of *Psilocorsis dubitatella* Z. (Hor. Soc. Ent. Ross., XIII, 262–3, 1887) in Dr. Staudinger's collection. It is a pale variety of the true *quercicella* Clem., with a slight transverse shade beyond the middle and the double dark line on the apical margin and cilia.

Cryptolechia obsoletella Z. of which I have the type, is very like a small *reflexella*, but shows no indication of the transverse darker striæ on the fore wings. I should regard it as distinct for the present. It is darker than *ferruginosa* Z.(of which I have also the type), having none of the ochreous tint of that species, but the discal and marginal dots are very similar, although somewhat more pronounced. Further investigation is required to clean up the life-history of these species. If one of them feeds on *Ambrosia* it seems improbable that this can be the species bred by Clemens from oak. Possibly the species I have from Miss Murtfeldt may not be the one referred to by Chambers.

Cryptolechia reflexella Clem.

Psilocorsis reflexella Clem. = *Cryptolechia quercicella* Z.

Zeller's collection contains a female of this species labeled *Psilocorsis quercicella* Clem., and it is evident that this is the specimen referred to by him (Ver. Z.-b. Ges. Wien., XXIII, 242) when in describing *obsoletella* he remarks, "Viel kleiner als *quercicella*." The species varies a good deal in size and in the distinctness of the distal and marginal spots. Apart from the color of the fore wings, which is distinctly darker and therefore less contrasted with the superficial speckled markings, the longer palpi, the darker color of the hind wings, and its lacking the distinct double blackish line in the cilia of the fore wings appear to be the chief distinguishing characters by which to separate it from *quercicella* Clem.

A specimen from Dr. Riley bred from Birch (*Betula* sp. ?) is only to be distinguished from *reflexella* by its smaller size and shorter palpi, wherein it approaches dark varieties of *quercicella*. I shall not venture to describe it as distinct.

Should an extended series of bred specimens of any of these darker forms establish a reliable means of distinguishing them, it is yet possible that one of Chambers' names may be hereafter revived for this more probable variety.

Cryptolechia concolorella Beut.

Mr. Beutenmüller has lately published (Ent. Am., IV, 30), a description under this name. He is probably right in referring it to this genus, but as he gives no description of the neuration, or of the form of the wings, nor any details of structure it is impossible to place it correctly.

STENOMA SCHLAEGERI Z., AND ITS ALLIES FROM THE UNITED STATES.

Cryptolechia schlaegeri was first described by Zeller in 1854, in the ninth volume of the Linnea Entomologica, pages 372–3, and figured on Plate 3, Fig. 18 of the same volume. The description was taken from specimens of both sexes from New York in his own collection; the hind wings are described as gray with whitish cilia. In the tenth volume of the same publication, pages 158–9, he supplements his description of the species, and compares it with the Mexican *Cryptolechia frontalis* there described. Here he remarks that the hind wings of the female are usually whitish. He goes on to describe a variety of the same species from Georgia, "var. *b.* ♂ parva, alis ant. breviusculis," in the King's Museum, at Berlin, of which he writes that the hind wings are lighter gray than in the male of var. *a*, but darker than in the female of that variety. A careful examination of about twenty specimens (including Zeller's type) from various localities in the United States proves that at least two distinct forms exist. These two forms are easily separable by the shape of the uncus in the males, and usually by the color of the hind wings; the commonest form having pale hind wings, especially in the ♀—*schlaegeri* of Zeller—has the uncus simple, scarcely enlarged towards its apex and ending in an obtuse point (Fig. 25*a*). The other having dark cinereous hind wings in the ♂, has the uncus dilated and distinctly notched or furcate at the apex (Fig. 25*b*). The form of the lateral claspers is approximately the same in both.

FIG. 25.—CRYPTOLECHIA SCHLAEGERI: *a*. Uncus of the common form. *b*. Uncus of the less common form. Enlarged (original).

The small variety (var. *b*. of Zeller's supplementary notice) from Georgia and Texas has the hind wings and simple uncus of the true *schlaegeri* and is apparently undistinguishable from it, except in size, since the markings on the anterior wings are subject to some variation in position and intensity of coloring in specimens of all sizes. The shorter ciliation of the antennæ, noticed by Zeller, is scarcely more than proportionate to the reduced size of each individual.

C. frontalis is described as having the hind wings gray, but broader than in *schlaegeri*. So far, so good. It is noticeable that in the supposed form of *schlaegeri*, described in Zeller's supplementary paper (Lin. Ent. X, pages 158–9) with paler hind wings (and simple uncus) there is considerable variation in the shape and position of vein 2 of the fore wings, both in the large variety (Zeller's var. *a*) and in the small form (var. *b* of Zeller). In some specimens vein 2 arises from the same point as vein 3 and proceeds with a slight bend to the margin above the anal angle. In others it arises either from the same point as vein 3, or extremely close to it, and is abruptly bent backwards in the first instance before taking its ordinary direction. In others again this vein arises quite separate from vein 3, being more or less bent in its outward course; in one specimen before me, which is undistinguishable from Zeller's var. *b*, these veins are separated at their origin by even a greater distance than that which separates veins 3 and 4, but this appears to be exceptional.

Stenoma leucillana Z.

Specimens in my collection, taken by Belfrage in Texas, agree very closely with Walker's type of the Nova Scotian *algidella*, but comparing it with a series of what I take to be *leucillana* Z., it can only be regarded as a dark variety of the female of that species. I think it extremely doubtful whether *leucillana* Z. is really distinct from the well-known *schlaegeri*, which varies sufficiently in size and color to connect it with this somewhat smaller and paler form. Indeed if I have rightly determined Zeller's *leucillana* it would be imposible to draw the line between them in a lengthening series. Until an opportunity may occur for examining the type specimen in the Berlin Museum, I prefer to err on the side of caution rather than to treat the name as a synonym. All my specimens of this smaller form have the uncus simple as in the true *schlaegeri.*

Stenoma algidella Wlk.

For the present I shall adopt the same course with regard to *Cryptolechia algidella* Wlk., which is probably also only a small form of *schlaegeri*, although occurring so far northward as Nova Scotia. Should the acquisition of further material enable me to express a more decided opinion the alteration can be made in the final revision of the index.

Stenoma furcata sp. n.

Antennæ in the ♂ brownish, finely ciliated on both sides; in the ♀ the color is much paler.

Head and palpi white.

Thorax slightly tinged with brownish-gray on the upper and central parts, without a patch of dark scales behind it.

Fore wings elongate, narrow, produced, but somewhat depressed and rounded at the apex; the costa very slightly arched at the base, scarcely convex beyond it; apical margin oblique; dorsal margin straight, almost parallel with the costal, but slightly diverging to the anal angle, which is ill-defined; white, with a slight tinge of brownish-gray, commencing near the base of the dorsal margin and extending to the anal angle below the discal cell, and very faintly in a narrow line along the base of the cilia in the apical margin; cilia white, tinged with grayish towards the anal angle and along their tips. In the ♀ there is a faint indication of pale, grayish clouds and spots at the end of the cell, and of a pale grayish transverse line between this and the apical margin on the lower half of the wing, and in the abdominal angle are some raised scales, as in *schlaegeri* (these would probably be found also in better specimens of the ♂); there are also a few divided black scales in the middle of the cilia; *under side* strongly clouded with brownish-gray; the costal and apical margins narrowly paler.

Hind-wings very broad, evenly rounded, but somewhat produced at the apex; dark cinereous in the ♂; pale grayish-ochreous in the ♀; cilia whitish; *under side* cinereous.

Abdomen cinereous; uncus abruptly bent over from the base, distinctly divided into two short forks at the apex; lateral claspers produced into two angular points, of which the lower one is smaller and sharper than the upper.

Legs whitish, unspotted.

Exp. al.: ♂ 27, ♀ 30 ^{mm}.

Habitat, Arizona. (Two males and two females collected by the late H. K. Morrison.)

Type, ♂ ♀, *Mus. Wlsm.*

This species differs from *Stenoma schlaegeri* Z. in its narrower and more elongate fore wings, which in the specimens before me have little or no indication of the gray clouds and blotches prevalent in that species, and very noticeably in the form of the uncus; also in the absence of the dark patch of scales at the back of the thorax. I have a single specimen, collected by myself in California in 1871, which might be regarded as an intermediate link between this species and *Stenoma schlaegeri.* It has

the uncus distinctly dilated and notched at the apex, a faint thoracic spot, and a few raised scales at the abdominal angle of the fore wings; there are no spots in the cilia, but a narrow gray line runs along the middle; the hind wings are nearly as dark as those of *furcata*, and the fore wings are somewhat more clouded with gray.

It will probably be found, when more material comes to hand, that the form of the uncus is a more reliable character for separating this species from *schlaegeri* than any distinction in the intensity of markings, which will probably be found to vary as in that species.

Stenoma crambitella sp. n.

Antennæ ciliated in the ♂; shining ochreous beyond the basal joints, which are white
Palpi white, slightly shaded with pale brownish-ochreous externally on the second. joint, except at the apex.
Head white; face smooth, shining yellowish-gray.
Thorax white, with a faint ochreous tinge.
Fore wings elongate, narrow at the base, very slightly convex at about the basal third of the costa, straight beyond; apex rather pointed; apical margin straight, oblique, rounded at the anal angle; dorsal margin straight, white, rather shining, with a suffusion of faint ochreous scales (only visible under a lens) along the veins and nervules; on the extreme costal margin at the base are a few grayish-fuscous scales, and a single dot of the same color lies at the end of the discal cell in the middle of the wing; cilia white.
Hind wings grayish-white, with a faint ochreous tinge; cilia white.
Abdomen agreeing in color with the hind wings; uncus simple, blunt, bent over, not notched at the apex (being much shorter than in *schlaegeri* or any of its allies with which I am acquainted); lateral claspers upturned, rounded at the apex, with a triangular excrescence on the lower edge near the base.
Legs whitish; posterior tarsi tinged with grayish-ochreous.
Exp. al.: 22^{mm}.
Habitat, Arizona (received from the late H. K. Morrison).
Type, ♂ ♀, *Mus. Wlsm.*

Stenoma humilis Z.

=*Cryptolechia humilis* Z.
=*Cryptolechia nubeculosa* Z.
=*Harpalyce canusella* Chamb.

Zeller, in describing *Cryptolechia nubeculosa* (Ver. Z-b. Ges. Wien., XXIII, 245–6, Pl. III, 12), does not refer to his previous description of *humilis* (Lin. Ent. X, 156–8, Pl. I, 6). A comparison of the figures would perhaps not lead to the conclusion that they were identical, but with five or six specimens undoubtedly *nubeculosa* before me, I am strongly inclined to the opinion that his older description of the species in the Berlin Museum had escaped his memory. The range of variation in the species is not great, but quite sufficient to account for the slight differences of markings detailed in the descriptions and figures.

MENESTA Clem.

=*Hyale*, Chamb.

The genus *Menesta* of Clemens is undoubtedly allied to *Cryptolechia* Z.; its neural and structural characters are the same as those of *Stenoma*, and notwithstanding its diminutive size and more abruptly rounded fore wings, it is doubtful whether in any tabulation of these genera it can be rightly separated from it. For the present it may be well to retain the genus as represented by a single species.

Menesta tortriciformella Clem.

=*Gelechia liturella* Wlk.
=*Hyale coryliella* Chamb.

This species has been redescribed by Walker (Cat. Sp. Ins. B. M., XXIX, 591) under the name of *Galechia liturella*, as already pointed out by me (P. Z. S. 1881, 319). *Hyale*

coryliella Chamb. (Cin. Qr. Jr. Sc., II, 242), which Chambers, in the Index (Bull. U. S. G. G. Surv., IV, 150), refers with a "?" to *Menesta tortriciformella*, is without doubt another name for this species, and consequently the genus *Hyale* sinks as a synonym of *Menesta*.

IDE.

The genus *Ide* is distinguished by having veins 7 and 8 of the fore wings separate, 2 and 3 from a point, or from a short common stem, and 4 very close to the base of 2 and 3; in the hind wings 6 and 7 arise from a common stem.

Ide lithosina Z.

Cryptolechia lithosina Z.
=*Harpalyce tortricella* Chamb.

I have several specimens of *lithosina* Z.; some from Texas (Belfrage), others from Florida (Morrison), and one from Boll's collection. They vary in the ground-color of the fore-wings from bone white, as described by Zeller, to yellowish or straw-color, as described by Chambers, and in the presence or absence of one, or sometimes two, brownish dots at the end of the discal cell. In one specimen these are quite conspicuous. A careful examination of the genital appendages shows that these forms are not specifically distinct; the uncus is single, with a long narrow stem beyond the dilated base; overarched and spatulate at the apex, the end of the spatulate being notched; the lateral claspers are scarcely more than half the length of the uncus; also somewhat narrowed at the base, their ends dilated and notched posteriorly, the upper lobe being rounded at the apex, the lower slightly longer than the upper, and acutely triangular.

Ide osseella sp.n.

Antennæ, pale bone-color.
Head and palpi, pale bone-color, the latter somewhat darker on the second joint.
Thorax, bone-gray, slightly darker than the head.
Fore-wings, shining, unicolorous bone-color, with scarcely paler cilia, along the base of which is a very slender almost undistinguishable grayish line; at the end of the disk is a reduplicated bone-gray spot, the larger portion of it being above the smaller, with which it is sometimes confluent. *Under side*, very pale bone-gray. Neuration: The veins are all separate, except 2 and 3 which in one specimen are from a common point, in the other from a short stem.
Hind-wings, pale, shining bone-gray, with scarcely lighter cilia. *Under side*, very pale bone-gray.
Abdomen, pale shining bone-gray.
Legs, pale bone-gray, the posterior tarsal joints with the slightest tinge of ochreous.
Exp. al., 24^{mm}.
Habitat, California. (Two females from the Zeller collection.)
Type, ♀, *Mus. Wlsm.*

This species is apparently allied to *lithosina* Z., but it is of larger size.

Ide vestalis Z.

Cryptolechia vestalis Z.
=*Harpalyce albella* Chamb.

Zeller in describing *vestalis* (Ver. Z.-b. Ges. Wien, XXIII, 247), says that it is closely allied to *albella*, but as Chambers' *Harpalyce albella* was not then published, it is obvious that his reference must have been to a species described by himself, under this name received from Surinam.

(*To be continued.*)

GENERAL NOTES.

THE BOT-FLY OF THE OX, OR OX WARBLE.

In INSECT LIFE, Vol. I, p. 383, we noticed the investigation recently undertaken by the *Farmers' Review*, of Chicago, of the damage to the cattle interests of this country resulting from the attacks of the Bot-fly of the Ox.

We have had considerable correspondence with the editor, as also with Miss Ormerod, on this subject; and as preliminary to a statement of our own views in the next number, we give here a summary of the articles mentioned and of the results reached in the several lines of investigation followed out.

The objects which the Farmers' Review hoped to attain are given in the issue of that journal of July 17, 1889, as follows:

(1) To impress upon the farmers of the country the seriousness of the loss they are annually suffering as a result of the work of the "grubs" in the backs of their (*a*) beef stock and (*b*) dairy cows.

(2) To arouse them to a recognition of the good policy and actual necessity of fighting (*a*) the Ox Warble-fly and (*b*) the grubs produced in cattle from eggs deposited by the fly.

(3) To show them plainly that the fly and its noxious product may be successfully fought and eventually reduced to perhaps uninjurious numbers.

(4) To interest all concerned and secure their help in (*a*) disseminating throughout the country facts going to show how serious is the damage done by these grubs in cattle, and (*b*) finding a demonstrating medium for the prevention and cure of the trouble.

(5) To instigate a national investigation of the matter by the Department of Agriculture.

In the introductory articles the life-history of the fly has been outlined, quoting for this purpose the short account in Packard's *Guide to the Study of Insects*, and the more important articles on the subject from the various reports of Miss Ormerod, of England, where the attacks of this fly have attracted greater attention than elsewhere, and where much attention has been paid to the means against it.

A host of letters from farmers and stockmen were published, which, so far as they related to the habits and natural history of the fly, were, as a rule, pretty badly mixed, and added little if anything to that already known. Reports were also received from professors of agriculture, entomologists, and veterinarians, which give, as did also those of farmers and stock-raisers, valuable data concerning its abundance in various States, the loss in value to hides, effect on quantity and quality of beef and milk, and also the effect of the attacks on the animals themselves.

From the reports received the approximate percentage of grubby cattle and the average loss on grubby hides for the principal stock-raising States of the Mississippi Valley have been estimated as follows (August 7, 1889):

Illinois.—Seventy-three per cent. of the cattle marketed in the grubby season are infested with grubs. The average loss on a grubby hide is one-third.

Iowa.—Seventy-one per cent. of the cattle in the majority of counties are grubby in the season specified. Loss on grubby hides one-third.

Indiana.—Forty-eight per cent. of the cattle grubby. Loss on hides one-third.

Wisconsin.—Thirty-three per cent. of cattle grubby. Loss on hides one-third.

Ohio.—Fifty-six per cent. of cattle grubby. Loss on hides one-third.

Missouri.—Fifty-seven per cent. of cattle grubby. Loss on hides one-third.

Kansas.—Sixty per cent. of cattle grubby. Loss on hides one-third.

Kentucky.—Fifty-seven per cent. of cattle grubby. Loss on hides one-third.

In *Minnesota* and *Dakota* grubs are practically unknown among cattle.

In *Nebraska* they are not very bad where found; twelve counties report an average of 40 per cent. The rest heard from are free of the pest. Grubby hides are "docked" one-third of their value.

In *Michigan* 61 per cent. of the cattle are infested with grubs in the southern and middle counties. In the northern counties they are unknown or very scarce. Grubby hides sell for one-third less than sound ones.

The amount of this loss can be better appreciated perhaps by reproducing in condensed form the approximate estimate of the loss on the hides of cattle received at the Union Stock-Yards of Chicago during the grubby season, which includes the months from January to June. Using the reports by States above given as a basis it is estimated that 50 per cent. of the cattle received are grubby. The average value of a hide is put at $3.90; and while from the report referred to one-third value is the usual deduction for grubby hides in this estimate, but $1 is deducted, or less than one-third. The number of cattle received in 1889 for the six months indicated was 1,335,026, giving a loss on the 50 per cent. of grubby animals of $667,513. When to this is added the loss from depreciated value and lessened quantity of the beef, the amount for each infested animal is put at $5, indicating a total loss on these animals from the attack of the fly of $3,337,565.

Without considering the lessened quantity, the inferiority of the beef of animals infested by the grub is strikingly shown in an article on the subject in which the testimony of retail butchers and buyers of meat in Chicago and other cities is given. It is shown that the buyers of the highest class of meat, who supply hotels and restaurants, will not on any account purchase carcasses showing traces of Warble attack. Such beef has to be sold, therefore, at a price below that obtainable for good beef, free from grub damage, and the lessened value per animal was put at from $2 to $5.

The appearance known as Licked-Beef, which, resulting from the presence of the grub, may be described as a moist or running surface of a greenish-yellow color, is certainly unwholesome in look, if not in fact. The description of such meat as given in the *Farmers' Review*, quoting

again largely from Miss Ormerod, is almost sufficient to turn one against beef altogether.

"The Effect of the Warbles in the Dairy" is the title of an interesting article by T. D. Curtis, in which the loss in the quantity of the flow of milk, as well as its deterioration in quality, resulting from the annoyance of the animals by the flies while the latter are depositing eggs and later by the grubs, is very conclusively shown, and he estimates the shrinkage at 10 per cent. and the loss in quality at the same rate, making a total of 20 per cent.

There is finally a discussion of remedies, including those employed in England and in this country, and the expression of a wish that the Division of Entomology of the U. S. Department of Agriculture should take up the investigation, with a view of clearing up such points as may yet be obscure both as to the life history of the insect and the means against it. We shall take up these points more fully in our future remarks.

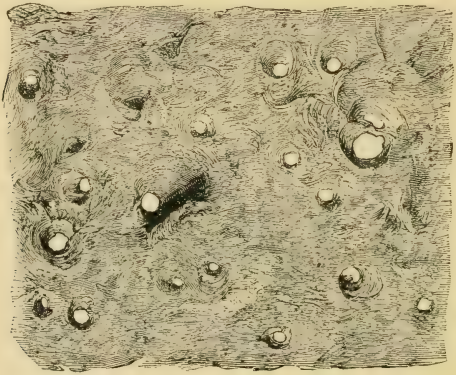


FIG. 26.—Portion of inside of tanned warbled hide (after Ormerod.)

We have recently received from Miss Ormerod a leaflet of eight pages, dated September, 1889, entitled "Notes on 'Licked-Beef' and 'Jelly' and Injury to Hides from Attacks of Ox Warble-fly, or Bot-fly," *Hypoderma bovis*, DeGeer, supplemented by correspondence, in which is described very fully the condition of the beef resulting from grub attack, commonly known as "licked-beef" or "jelly" from the supposition generally held that the loosening of the hide and the discoloration and inflammation of the subcutaneous flesh about the grubby places, and also the frothy or jelly-like appearance of the flesh, results in part from the licking by the animal of such places. Letters from butchers are quoted, giving further details of the exact nature of the injury and the amount of depreciation in value of the beef.

The loss is shown to fall largely on the cattle-owners by waste of food not formed into beef or milk, and also, but to a less extent, on butchers in the deficiency of receipt per pound on the carcass and on the hide. We reproduce a single instance given by Miss Ormerod to indicate the extent of the loss so resulting. A heifer which turned out a much lighter weight than was expected proved to be badly warbled. "The loss on the hide at 1*d.* per pound would be about 5*s.* ($1.25); the loss on the beef, the animal being sold by the stone, fell on the owner. This was estimated at least six stone less than it should have been, and deficiency in weight on hide and beef was put at 50*s.* to 60*s.* ($12 to $15).

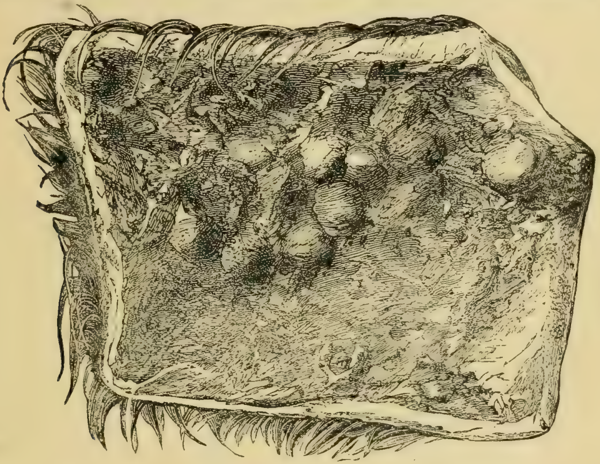


FIG. 27.—Piece of warbled hide; warbles about half size (after Ormerod,.

The mischief done to the hides in the decreased value of the tanned product is also discussed by Miss Ormerod, and figures are given, which we reproduce, showing a portion of the under side of a warbled hide, warbles about half size, and a portion of inside of tanned warbled hide.

The aggregate loss in England from warble attacks as estimated by different practical men is put at from £2,000,000 to £7,000,000 sterling, at least, per annum, or perhaps as much as £1 per head of horned cattle.

THE MINNESOTA LOCUST OUTBREAK.

The report of Prof. O. Lugger, Entomologist of the Minnesota Agricultural Experiment Station, on the Rocky Mountain locusts, in Otter Tail County, Minnesota, in 1889,* is of especial interest.

As we have long ago shown in our Reports on the Insects of Missouri, and in the Reports of the U. S. Entomological Commission, plow-

* Bulletin No. 8, University of Minnesota, Agricultural Experiment Station, pp. 17–36.

ing in winter-time or early spring is the most effectual means of preventing grasshopper injury the coming summer; but this recommendation has rarely been carried out on a co-operative scale. In the grasshopper-infested section of Minnesota, however, Professor Lugger has shown the present year what can be accomplished by timely and energetic co-operation.

In the fall of 1888 it was ascertained that in the infested region of Otter Tail County enough eggs had been deposited by late swarms of locusts to seriously endanger the crop of 1889. It was found that the eggs were preferably laid in stubble-fields abandoned by their owners, and also in certain spots in the timothy fields and pasture lands. In winter-time the governor and State legislature were appealed to, money was promptly appropriated and rendered available immediately, and competent persons appointed to superintend operations, which were executed in early spring with energy and circumspection. At first the larger of the abandoned stubble-fields in the immediate vicinity of cultivated fields were plowed, and then the worst infested places in the timothy fields and pastures. The whole area thus plowed in this single county, at the expense of the State, embraced no less than 6,361 acres. The farmers in the mean time plowed the fields intended for the use of corn, and largely assisted the State authorities in plowing at their own expense the smaller fields which were ascertained to contain a dangerous number of eggs.

The success of this operation was complete. Not a single grasshopper egg hatched on the plowed fields wherever the plowing was done carefully and to a sufficient depth. When, in the month of May, the grasshoppers hatched on the timothy fields, the farmers, knowing that there was now no danger of an invasion of grasshoppers from the neglected or abandoned fields in their vicinity, willingly set to work to assist the authorities in the warfare against the young locusts. A large number of "hopper dozers" (coal-oil pans*), previously prepared, were at hand, and were operated on a large scale. Burning stubble wherever practicable, and, in one instance, a judicious use of London purple, was also resorted to.

"About the middle of June," says Professor Lugger, "it became quite plain that the crops were saved, and that most of the locusts had been killed."

This gratifying result was obtained at a comparatively trifling expense, and we congratulate Professor Lugger on the success of his efforts in this direction.

THE WEEPING-TREE MYSTERY.

Prof. Herbert Osborn has called our attention to an article in the Dallas (Texas) *Morning News* of October 9, in which a very well written

* First described and recommended in Riley's "The Locust Plague in the United States."

and humorous account is given of the solution by the reporter of that paper of the mystery of the so-called "weeping trees," reports of which from Grayson County and other parts of Texas are said to have "set the State agog with various explanations of the phenomenon, ranging from the superstitious credence of the supernaturally inclined to the positive denial and derisive laugh of the constitutionally skeptical." The brave reporter, however, upon the discovery of one of these remarkable trees in Dallas, laying aside all superstition, climbed courageously up the trunk and discovered that the tears were shed by a multitude of small insects "of dark green color with gold under the wings, which adhered to the bark and scampered about when disturbed, and flew away when pressed too closely." Prof. G. W. Curtis, of the Texas Agricultural and Mechanical College, secured specimens and sent them to Professor Osborn, who recognized them as the common little leaf-hopper, *Proconia* (*Oncometopia*) *undata*, which we have referred to in previous writings and on pages 53 and 54 of vol. 1 of INSECT LIFE as occurring upon the Orange in Florida and upon cotton-plants in other Southern States, and which we have there stated is remarkable for the distance to which it ejects drops of honey-dew.

We frequently met with this species in the cotton-fields in the summer of 1879, and noted the extraordinary abundance of the secretion. Professor Curtis in his letter to Professor Osborn stated that in Dallas they made the tree present a decided appearance of weeping quite profusely, the drops being small but coming quite thick and fast. Each insect would eject a drop at intervals of two seconds during a period of several minutes, and would then stop for a little while.

AN EARLY OCCURRENCE OF THE PERIODICAL CICADA.

Dr. J. C. Ridpath, the historian, has very kindly sent me the following extract from one of the many valuable works contained in his private library. The writer had the State of Virginia under consideration when the excerpt was written, and therefore it is quite probable that the third prodigy was an occurrence of what is now known as Brood VIII of *Cicada septendecim*.—F. M. WEBSTER.

[Stedman's Library of American Literature, Volume I, pages 462, 463. Excerpt from the writings of T. M., supposed to have been Thomas Matthews, son of Samuel Matthews, governor of Virginia. Written in 1705.]

About the year 1675 appeared three prodigies in that country, which, from the attending disasters, were looked upon as ominous presages.

The one was a large comet every evening for a week or more at southwest, thirty-five degrees high, streaming like a horse-tail westwards until it reached almost the horizon, and setting towards the northwest.

Another was flights of pigeons, in breadth nigh a quarter of the mid-hemisphere, and of their length was no visible end; whose weights break down the limbs of large trees whereon these rested at nights, of which the fowlers shot abundance and eat them; this sight put the old planters under the more portentous apprehensions, because the like was seen, as they said, in the year 1640, when the Indians committed the last massacre, but not after until that present year, 1675.

The third strange appearance was swarms of flies about an inch long and big as the top of a man's little finger, rising out of spigot holes in the earth, which eat the new-sprouted leaves from the tops of the trees without other harm, and in a month left us.

LAPHRIA CANIS Will.: A CORRECTION.

On page 43 of the present volume of INSECT LIFE the statement is made that *Laphria canis* Will. was very abundant in Michigan in May, 1886. The writer has since felt that this statement admitted of doubt, as the habits of the fly there described are unquestionably those of *Bibio albipennis*, which was, in all probability, the species under observation. The specimen of *Laphria canis* which I sent to Dr. Williston for determination was taken some months afterward from among alcoholic specimens of flies, and believed at the time to be one of the individuals that had been so numerous in the spring, but in this I fear that I was deceived. *Laphria canis* should, of course, be recorded for Michigan, on the authority of one specimen of uncertain date of capture, determinedby Dr. Williston.—T. TOWNSEND.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

October 3, 1889.—Fifty-fifth regular meeting. Prof. James Fletcher, Entomologist to the Dominion of Canada, was elected a corresponding member of the society.

Dr. Fox made some remarks on "Malformations in Spiders," exhibiting two specimens (*Epeira sclopetaria* ♂, and *Dictyna* sp. ♀), in which one or more of the eyes were absent. He also exhibited a table showing the relative position of the eyes as normally found in different families of spiders. The subject was further discussed by Dr. Marx.

Mr. Schwarz then read a communication from Dr. G. H. Horn on the food-habits of a rare Cerambycid beetle (*Cœnopœus palmeri*), which lives in its early stages in the stems of *Opuntia bernardina*. These food-habits are the more remarkable from the fact that all the other known species of this group (*Acanthocinini*) live beneath the bark of dying or dead trees. Mr. Schwarz also read a note on the peculiar flight of a specimen of the flying locust, *Dissosteira carolina*, while observed to be pursued by an English sparrow, its flight, in escaping the bird's attacks, veering directly up or down, but never to one side; and presented for record an observation on *Chalybion cœruleum*, a blue wasp, which in catching the spiders that form its prey, pretends to be caught in their webs and easily captures them when they appear. These papers were discussed by Dr. Marx and Mr. Ashmead.

Mr. Townsend read a paper on some interesting flies from Virginia, noticing and exhibiting specimens of: *Holcocephala abdominalis*, to Say's description of which he made some additions; four species of *Trichopoda* (*T. radiata* Loew, *T.? hirtipes* F., *T.? ciliata* F., and *T.* sp.), two of which have not been recorded for this locality; and *Palloptera superba* Loew, with some notes on its habits.

Dr. Marx read by title a revision of Hentz's Spiders of North America. The meeting then adjourned.

WM. H. FOX, M. D.,
Recording Secretary.

U. S. DEPARTMENT OF AGRICULTURE.

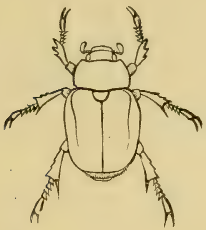
DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. DECEMBER, 1889.

Vol. II. No. 6.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS.



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SPECIAL NOTES.

The Official Association of Economic Entomologists.—We devote considerable space in this number to the official minutes of the first annual meeting of this association, which was held November 12, 13, and 14 in this city, as announced in Vol. II, No. 4. The meeting was very successful, both in point of attendance and in the character of the discussions and the papers read, and it was especially gratifying to have so many who were not in attendance apply for active and associate membership. The general sentiment, as expressed in discussing such questions as that of co operation, seemed to be that the association should retain the broader character originally designed, which would include in its membership others engaged or interested in economic entomology who are not necessarily connected officially with agricultural colleges or experiment stations, though it is very evident that the more active members will consist of those officially employed in one way or another. In view of the simultaneous meeting in the same museum building of the Association of Agricultural Colleges and Experiment Stations, the question of how the entomological organization could best co-operate with the other was one of the most interesting, and one which it seemed at first difficult to solve. The fact that the Association of Colleges and Experiment Stations decided to organize committees in different specialties—one being in entomology—to a certain extent limited the co-operation, and at the same time facilitated it, since said committee, working with a similar committee from the entomological association, will be able to perfect plans of co-operation and help to carry them out.

Studies in Embryology.—We have just received from the author a valuable contribution to our knowledge of the embryology of insects in a paper by William M. Wheeler, curator of the public museum, Milwaukee, Wis., entitled "The Embryology of *Blatta germanica* and *Doryphora decemlineata*," reprinted from the *Journal of Morphology*, Vol. III, No. 2, September, 1889.

After describing his method of work and the manner in which the eggs and other material were prepared for study, the author discusses the formation of the eggs in the ovaries; oviposition and the subsequent development of the embryo, including a discussion of the formation of germ layers and embryonic envelopes, together with a description of the external change in the embryo of *Blatta* and the subsequent stages in the evolution of the embryo in *Doryphora*.

The author concludes with a list of the authorities referred to in the course of his work. The article covers 92 pages and is illustrated with 16 text figures and 7 large lithographic plates.

Willow and Poplar Insects.—In Bulletin No. 9 of the Agricultural Experiment Station of the University of Minnesota, the first portion of which contains a consideration of Russian willows and poplars, we find some sixteen pages by Prof. O. Lugger, treating of insects affecting poplars and willows. He describes at some little length, with figures, *Cimbex americana*, *Nematus ventralis*, *Lina scripta*, *L. tremulae*, *L. lapponica*, *Saperda calcarata*, *S. concolor*, *Vanessa antiopa*, *Hyphantria cunea*, *Acronycta lepusculina*, *Platysamia cecropia*, and *Telea polyphemus*. The articles are brief and popular, and contain for the most part restatements of well-known facts; but the author mentions that *Cimbex americana* is attacked by a Tachinid fly in Minnesota. The work of the Poplar Girdler (*Saperda concolor*) is for the first time illustrated, and a number of different species of parasitic Ichneumonidæ are reported to have been bred from it. *Acronycta populi*, Riley, is made a synonym of *A. lepusculina*, Guenée, following Grote; but this is an error, the latter species, known to us, being different in both larva and imago, and occurring on the Pacific coast.

Another Importation from Europe.—Prof. J. H. Comstock, in Bulletin No. 11 of the Agricultural Experiment Station of Cornell University, has given in detail an account of the life-history of the well-known European Corn Saw-fly (*Cephus pygmaeus*), which, curiously enough, he finds very abundantly in wheat on the university farm. This insect has not previously been recorded in this country. Professor Comstock finds that the adults emerge early in May, oviposit about the middle of the month, and that in a very short time the larvæ work through nearly the entire length of the straw, descending early in July to the root. Here, after cutting the straw nearly through an inch above the ground, they spin silken cocoons and remain dormant until early the following spring, when they complete their transformations.

He finds that their presence in the stalk reduces the abundance of the grain little, if any, and that the principal damage is the lodging of the grain. He has found the species in wheat alone. He has seen para-

sites in two cases, but has not been able to secure good specimens. He thinks that the insect is not confined to the vicinity of Ithaca, but that it will be found elsewhere. Experiments made to ascertain the amount of damage by weighing the grain from the infested and the non-infested heads showed in every case a decided superior weight in favor of the heads of the infested stalks. The explanation offered—undoubtedly the correct one—is that oviposition takes place early and that only the largest stalks are chosen.

Professor Smith's Bulletin on the Horn Fly.—In bulletin No. 62 of the New Jersey Agricultural Experiment Station, Prof. J. B. Smith summarizes his observations on the Horn Fly (*Hæmatobia serrata*). We notice from the date that the bulletin was submitted just about the time our article on this insect in No. 4 of Insect Life appeared, and, as a result, neither our observations nor our conclusions are referred to. Professor Smith has also succeeded in tracing the life history. He secured eggs in confinement August 6, from which the imagos issued August 20 and 22. The bulk of the bulletin is taken up with extracts from extensive correspondence, and some fifteen pages more with descriptions of the different states and with anatomical details accompanied by figures. He suggests the use of plaster instead of lime for the manure heap on chemical grounds and for the preservation of the fertilizing qualities of the manure. He further suggests that, by sending a boy through the pasture with a shovel and with instructions to thoroughly spread all cow droppings so that they may rapidly dry out, the larvæ and eggs will be destroyed—a suggestion of value only in dry and sunny weather. He erroneously supposes that the eggs are largely laid at night, while our latest observations prove plainly that this is not the case, and this vitiates the discussion of remedies as applied to the manure pit or the interior of the stable wherever cattle are pastured during the day.

Entomology at the Paris Exposition.—The record of the fact that two grand prizes for the United States were awarded at the Paris Exposition (one to the Department of Agriculture and one to the Entomologist) in class 76, which comprises useful and injurious insects, will not be out of place in these pages. Only one other grand prize was awarded in this class, and that was to Japan. This exceptional recognition of our exhibit at Paris is, *çela va sans dire*, gratifying, but not more so than the fact that the agricultural exhibit, included in fifteen classes, received seven grand prizes, forty gold, sixty-eight silver, and fifty-four bronze medals, and thirty-nine honorable mentions. This is a relatively larger percentage of medals, than was awarded to the United States in the other seventy-one classes, and a very much larger percentage of awards in the agricultural groups, as compared with those obtained by the United States, either at the Paris Exposition of 1867 or of 1878.

THE SO-CALLED MEDITERRANEAN FLOUR MOTH.

(*Ephestia kühniella* Zeller.)

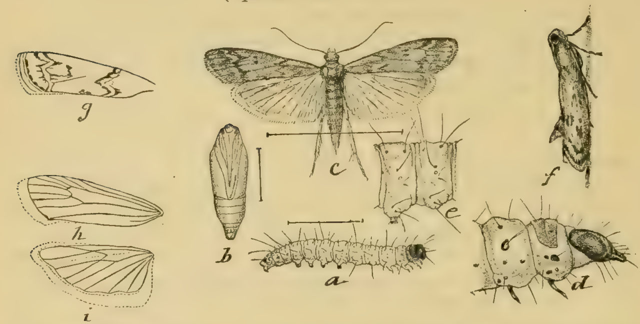

FIG. 28.—*Ephestia kühniella:* *a*, larva; *b*, pupa; *c*, adult—enlarged; *d*, head and thoracic joints of larva; *e*, abdominal joints of same—still more enlarged; *f*, moth from side, resting; *g*, front wing, showing more important markings; *h*, venation of fore-wing; *i*, venation of hind-wing—somewhat enlarged (*a*, *b*, *c*, and *e*, original; *d*, *f*, *g*, *h*, and *i*, after Snellen).

This insect, which during the last few years has been doing so much damage in mills in England, Belgium, and Germany, has during the past summer appeared in destructive numbers on this continent. During August the attention of Mr. James Fletcher, Dominion entomologist of Canada, was called to a serious outbreak of this pest in a Canadian city,* which has recently been written up by Dr. P. H. Bryce, secretary of the provincial board of health in Ontario, and issued in pamphlet form in Bulletin No. 1 of this organization. We publish in this number, under the head of "Extracts from Correspondence" a letter from Mr. Fletcher referring to this outbreak, which has suggested the desirability of bringing together in condensed form a summary of the known facts concerning this pest, and a few points suggested by our notes and collections.

It will be remembered that in INSECT LIFE for March (Vol. I, p. 315) we published a long letter from Miss Ormerod, in which she described the damage done by this pest in England, and that in our reply (*loc. cit.*) we stated that the species does not occur in the United States. In the hurry of getting ready to leave for Paris we allowed this statement to be made, notwithstanding the fact that we had had in the National Museum collection for some time specimens of a moth indistinguishable from this species from A. W. Latimer, of Eufaula, Ala. On referring to our notes we find also that we had seen specimens from North Carolina in the collection of M. Ragonot in Paris. These facts undoubtedly prove the occurrence of the insect in North America for at least some years back. Up to the present time the species seems to have been

* We omit the precise locality by request.

rare here, for every case of serious damage to grain by Lepidopterous larvæ which has been carefully investigated has shown that the author of the damage was either the Angoumois Moth (*Gelechia cerealella*), the Grain Moth (*Tinea granella*) or *Ephestea interpunctella* (=*zeæ* Fitch), a congeneric insect which was treated by Dr. Fitch under the common name of the "Indian-meal Moth."

As will be seen by the following digest of recent European writings on the subject, the insect is supposed to be of American origin, but admitting that it has been known for a few years in America, and that during the summer of 1889 it made a destructive appearance in Canada, the point as to its origin still remains obscure. It has, in fact, really been known longer in Europe than in America, and the first specimens from which Professor Zeller described the species were reared in Germany. It seems to be simply another instance of the extreme readiness with which Europeans attribute all new pests to this country.

That the insect is with us now, however, in destructive numbers, and that it is a pest of no small magnitude, cannot be doubted. The condition of affairs in Canada, as stated by Mr. Fletcher in his letter, is by no means exaggerated. Mr. Howard was in Canada the latter part of August, and accompanied Mr. Fletcher on a tour of inspection to the worst infested establishment, and the entire building was completely overrun by these creatures. Hardly a crack or a nail hole was to be found

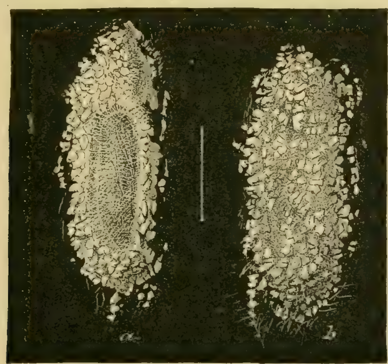

FIG. 29.—*Ephestia kühniella*: *a*, cocoon from below, showing pupa through the thin silk attaching the cocoon to a beam; *b*, same, from above—enlarged (original).

without the cocoons (Fig. 29), and every bit of flour or grain remaining was spun together by their webs. The moths were still flying about in numbers, although great efforts had already been made to destroy them. The government of Ontario made strenuous efforts to stamp out the pest, as can be seen from the bulletin already mentioned. The machinery was taken down and steamed, the walls were scraped down,

and the elevator spouts and loose wooden work, together with pipes, bags, and quantities of stock were burned up; belts, cups, and cloth bags were boiled and the whole place was subjected to sulphur fumes. Every inch of space about the machinery was subjected to the flame of a kerosene torch. For a long time before this energetic treatment was commenced (for the pest was noticed as early as March) the moths were flying freely about the building and hundreds must have escaped through the open windows to enter other mills and feed-stores, and by depositing their eggs commenced the ruin of other millers and dealers.

The insect in question appears to have been first brought to the attention of an entomologist in 1877, when the moths and larvæ were sent to Prof. P. C. Zeller from a flour mill in Halle a. S. Professor Zeller described the species in the *Stettiner Entomologische Zeitung* for 1879, pp. 466–471, naming it after the gentleman who sent him the first specimen, Kühn, and stated that in the mill in which they appeared American wheat is much used. The flour is spun up by the larvæ into a kind of felt, and in this felt they dwell in silken tubes. The moth appears in the greatest numbers in May and June, and a second generation appears in August. Professor Zeller had never seen it before in any collection of European or exotic insects, but did not hesitate to state that it came, in all probability, from North America; why, nobody knows. P. C. T. Snellen, in the *Tijdschrift voor Entomologie* for 1881, pp. XX to XXII of the proceedings, has mentioned Zeller's paper.

In 1883, Professor Zeller wrote to us, under date of February 20, as follows:

I send herewith *Ephestia kühniella* in order to ascertain positively whether it is really of North American origin. This predaceous domestic insect, the natural history of which is described in the *Stettiner Zeitung*, appears to have died out here at Grünhof. * * *

Preudhomme de Borre, in the *Comptes Rendus de la Société Entomologique de Belgique*, July 5, 1884, gave an account of the injury done by this insect in a noodle factory in Belgium, where the insect was supposed to have been introduced with American corn. Various plans for disinfecting the mill proved useless, the only effective remedy being a thorough cleaning.

Dr. F. Karsch in the *Entomologische Nachrichten* for May, 1884, under the caption "*Ephestia kühniella*, Zeller, Eine Nord Amerikanische Phycide am Rhein," records the appearance of this moth at several places along the Lower Rhine. The specimens bred by him have fore-wings of a glossy lead gray, whereas in the typical specimens raised by Zeller the ground color is pure yellow or nearly brownish. He refers them unquestionably, however, to one species. He had looked in vain through American literature for an account of this moth. Fitch's *Tinea zeæ* is the only one that approaches it, but his description does not agree with *kühniella*. Dr. Karsch, nevertheless, thought *zeæ* might prove to be a variety of *kühniella*. In the same month (May, 1884) M. Maurice Girard, (*Bulletin des Séances de la Société Entomologique de France*, pp. LXXIII,

LXXIV) read a note on the ravages of this moth which had appeared in enormous numbers in a flour mill at Lodelinsarte, Belgium. He added a short description of the moth and larva. M. E. Ragonot stated in the discussion of this note of M. Girard that the insect had been first noticed in Europe in 1879 by Zeller, and was supposed to have been imported with American flour. Ragonot himself had specimens coming from North Carolina, Mexico, and Chili.

In an editorial note in the *Entomologische Nachrichten* for 1885, pp. 46, 47, mention is made of reports of the appearance of this insect in mills near Bremworde. The insect multiplies with incredible rapidity. The application of bisulphide of carbon and the burning of sulphur were useless. All that could be done was to stop the mill and thoroughly clean out the pipes and screens. It is positively asserted in this note that in this locality it had been ascertained that the insect was introduced with American wheat. In another editorial note in the same periodical for the same year (pp. 239, 240) a review is given of a communication by Prof. H. Landois to the *Braunschweiger Tageblatt*, in which it is stated that this pest is by far the most annoying and dangerous of all the insects affecting wheat or flour. Moving and airing the wheat is said to have no effect against this species, which is fond of a draft. Countless numbers of webs were found in a pipe through which the flour was lifted by air pressure. For many days they were forced to shut down in order to clean the pipes and screens. The larvæ preferably gnawed the fine miller's gauze. An anatomical examination showed the number of eggs in a single female to be 678.

Prof. P. C. T. Snellen in the *Tijdschrift voor Entomologie*, Vol. 28, 1885, pp. 237–251, gives quite an extended article on this insect, which is illustrated with Plate 8, in all the different stages and in colors. The figures were drawn by Prof. Dr. J. Van Leeuwen, jr. The author states that the main object of his article is to introduce the illustration, as it is made up chiefly of a summary of Zeller's article already referred to. He makes some remarks on the color of the larvæ in correction of Zeller, gives a short account of the mode of pupation, and a careful description of the pupa. The bulk of the article, however, is taken up with a comparison of *kühniella* with other European species of *Ephestia*.

There follow now five articles published in English periodicals, two by W. Thompson, one by J. W. Tutt, one by Charles G. Barrett, and one by Sidney Klein. Mr. Thompson, on pages 66 and 139 of *The Entomologist*, Vol. 20, 1887, records the breeding, during November and December, of specimens of this insect found feeding on rice-cones. Mr. Tutt, on page 212 (*loc. cit.*), records the breeding of larvæ found feeding on flour in a cargo at the London docks, giving a short account of the feeding habits. Mr. Barrett, on pp. 255–256 of *The Entomologist's Monthly Magazine*, Vol. 23, April, 1887, summarizes Zeller's observations, and refers to Mr. Thompson's experience. Mr. Klein's article is published in the *Transactions of the Entomological Society of London*, 1887,

monthly proceedings, pp. LII to LIV. His observations were made from May to September, 1887, on an immense colony of larvæ which had over-run some large warehouses in the east end of London. Fumigating with sulphur and hot-liming the floors, ceilings, and walls for several days did not prevent their spread. The flour was mingled with silk threads so as to be useless. The eggs appeared to be laid on top of the sacks, and hatched within a few days. The larvæ burrowed through the sacking, spinning long galleries through the flour, generally not penetrating to a greater depth than three inches. When full grown they leave the flour, crawl to the floor and up the wall, and spin their compact cocoons at the angle of the wall with the roof. They are difficult to keep in breeding cages on account of this migratory habit when full grown, and because they escape through the smallest orifices. Chickens were introduced into the warehouse and gorged themselves with the larvæ. A small ichneumon fly destroyed the pest by September.

The principal English article, however, is by Miss Ormerod. In her twelfth report, for 1889, she reviews the previous accounts of the pest in England and refers to a new case in the north of England, where they made their appearance in 1888. The larvæ entered the spouts and machinery, destroying the silks, and stopped the flow of flour through the spouts by their webs. Remedies were tried as follows: The mill was stopped for a week, the machinery was thoroughly cleaned, hot steam was run into the machines and all through the mill. The walls and floors were whitewashed with freshly slacked lime and paraffine (the English term for what we call kerosene in this country), and all moths that were seen were captured and killed. This heroic treatment failed to destroy the pest. It was supposed that this north of England case was due to the importation of eggs and young larvæ in returned empty sacks from London. Miss Ormerod thinks that the insect came to England from Europe or the East rather than from America, although the sole reason which she gives for this supposition is the fact that the name of the moth does not occur in Grote's check list of the moths of North America in 1882.

Dr. Bryce's bulletin, elsewhere referred to, and quoted by Mr. Fletcher, we will not mention in detail. It is prepared with care, but the figures could not well be poorer or more characterless.

Our own studies of *kühniella* have been made upon material brought us by Professor Panton, of the Guelph Agricultural College, last summer; others in the National Museum collection, which contains the rubbed specimen from Eufala, Ala., five from Europe from M. Ragonot, and others received from Zeller in 1883.

Ephestia interpunctella we have bred upon a number of occasions. We first raised it upon wheat at St. Louis, in October, 1870. Larvæ have been sent to us from a meal-sack at Boylston, Mass.; we have reared it from corn from Guatemala; larvæ and moths were received from a firm of manufacturing chemists from Detroit, Mich., who had found

them crawling about over sacks containing roots of dandelion—moths, in fact, being found in the bags; we found numerous larvæ infesting wheat in the Atlanta Exposition building in 1884; large numbers of larvæ were also found in a jar containing Chickasaw plums at the same exposition; larvæ were received from Ripley, Miss., on two occasions in 1885, some of which were said to have been found feeding on sugar in barrels; one specimen was bred from dry Opuntia from Texas; larvæ were received from Detroit, found among old books; larvæ of all sizes were found infesting Pecan nuts in St. Louis, in September, 1872; moths were bred by Dr. A. W. Hofmeister in Iowa from Cinnamon bark; moths were bred from English walnuts in St. Louis in 1876, and the species in all states was found abundantly in a wheat warehouse in Alexandria, Va., in 1883. Moreover, in 1873, at St. Louis, one of these moths was bred from old woolen stuff in company with *Tineola biselliella*, but there is some doubt connected with this case.

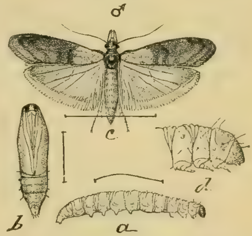

FIG. 30.—*Ephestia interpunctella*: *a*, larva; *b*, pupa; *c*, adult—enlarged; *d*, head and thoracic joints of larva—still more enlarged (original).

We have figured the states of *interpunctella* (Fig. 30) in comparison with those of *kühniella* (Fig. 28), in order that both may be readily recognized. The early states are quite similar in appearance, but the larvæ may be distinguished by the following characters:

The larvæ of *kühniella* are more slender and of a more uniform diameter than those of the other species. The abdominal legs are longer, cylindrical, with a circular fringe of hooklets at the crown. In *interpunctella* the legs are short, conical, with the fringe of hooklets at the crown oval. All piliferous warts in *kühniella*, most of which are rather minute, are still rather prominent, readily observed, and of a black or brown color. Those most conspicuous are the lateral ones, in front of the first spiracle; the subdorsal one, each side of the meso-thorax, almost completely encircled by a narrow black ring interrupted only at its upper margin (Fig. 28*d*). In *interpunctella* all the warts, while present, are concolorous with the rest of the body, and can be distinguished only with great difficulty. The surface of the body of *kühniella* is almost perfectly smooth, while that of *interpunctella* is somewhat granulate.

THE OX WARBLE.

(*Hypoderma bovis* De Geer.)

With each of the recent, and withal valuable, articles in the *Farmers' Review** relating to the above-named insect, appeared the running headline, "The First Investigation of the Subject in this Country," and this rather boastful announcement was coupled with certain reflections on the study of this insect by entomologists of this country, which were scarcely justified and added nothing to the otherwise excellent results obtained. While it is true that no careful estimate of the amount of damage occasioned by the fly in this country had been previously made, and the data relating to this phase of the subject is the most valuable outcome of the work of the journal referred to, it is also equally true that the life-history and habits of the fly, and the means against it which the *Farmers' Review* recommends to its readers as of most value, have been frequently given in various agricultural and scientific journals of this country.

Indeed, the chief characteristics and habits of this common cattle pest, which occurs all over the civilized world, have been known, together with some of the means now recognized as of the most avail against it, from the earliest times. One of the best accounts appeared nearly one hundred years ago in the *Transactions of the Linnæan Society of London*, 1796, Vol. III, page, 289 in a paper read by Mr. Bracy Clark, entitled "Observations on the Genus Œstrus," in which the habits and means against the Ox Bot were detailed practically as they are known to-day. Vallisnieri, Réaumur, Geoffroy, De Geer prior to Clark, and Fallen, Joly, Brauer and Schiner subsequently, have each published careful observations.

This insect has not attracted so much attention in the United States as in England, especially since Miss Ormerod began to investigate and publish upon the subject. Nor is its work so important with us as it is in England, on account of the relatively higher price of cattle and hides there. Yet in our scrap books we have a considerable number of articles clipped from American journals during the past twenty years, and in January, 1877, we published in the *Scientific American* an article on Bots which was quite widely quoted, and which, while dealing with bots in general, gave briefly the habits, ravages, and means against *H. bovis*.

We may here reproduce that article as far as it refers to the insect under discussion, and add such further details as may be necessary to a full understanding of the subject:

* * * Almost all cloven-footed animals, and many other herbivorous species, are infested with bots. These are legless grubs which fall into three categories: (1) Gastric, or those which are swallowed by the animal infested, and which live in the stomach in a "bath of chyle." (2) Cephalic, or those which crawl up the nostrils and inhabit the frontal sinuses. (3) Cutaneous, or those which dwell in tumors just beneath

* See INSECT LIFE, Vol. II, No. 5 (Nov., 1889) pp. 156–158.

the skin. They are all the larvæ or early states of two-winged flies (Diptera) belonging to the family Œstridæ, characterized by having the mouth parts entirely obsolete, and popularly called gad-flies or bot-flies. * * * In the third kind, the parent lays the egg on those parts of the body which can not well be reached by the mouth of the animal attacked, and the young grub, which soon hatches, burrows in the flesh, and subsists upon pus and the diseased matter which results from the wound inflicted, and the irritation is constantly kept up. The well-known wormal or ox bot (*Hypoderma bovis*), so common along the backs of our cattle, and especially of yearlings and two-year-olds, and dreaded as much by the tanner as by the animal infested, is typical of this kind. Residing in a fixed spot, we no longer find in this species the strong hooks at the head, and the spines around the body are sparse and very minute, while the parts of the mouth are soft and fleshy.

All bot-larvæ breathe principally through two spiracles placed at the blunt and squarely-docked end of the body, and in the ox bot these are very large, and completely fill up the hole to the tumor in which the animal dwells. When ready to transform, it backs out of its residence, drops, and burrows into the ground, and there, like the other species, contracts, and undergoes its final change to the fly. The eggs of this ox bot are elliptic-ovoid, slightly compressed, and have at the base a five-ribbed cap on a stout stalk with which to strongly attach them to the skin of the animal. (See Fig. 33*a*.)

The perfect insect (see Fig. 31) is something over one-half inch in length, black, banded with yellow, as indicated in the figure, and is not unlike a bee in appearance. The flies issue during the entire summer, but are particularly abundant during the months of July and August. The individual life of each fly is, however, comparatively brief, not exceeding a month. The time between the deposition of the egg and its hatching has not been definitely observed, but, from what is known of other species of the family, will be found to last but a few days. During the fall and winter months the young larvæ develop very slowly; but in spring and early summer growth is much more rapid and the characteristic hard swellings with central opening, now large and prominent, exuding a yellowish matter, may easily be discovered. Fig. 33*b* represents the full-grown larva, together with the figures of the anal breathing pores, all enlarged. (The lines at the side of the larva, puparium, and egg indicate their natural size.)

FIG. 31.—*Hypoderma bovis*—enlarged (after Brauer).

FIG. 32.—*Hypoderma bovis*; head of female fly from the front—enlarged (after Brauer).

On escaping from the back of the animal the larva, which in the earlier stages is yellowish white, is of a gray color, which rapidly darkens until in the contracted puparium the color becomes very dark brown, almost black. The pupa state lasts about thirty days, the time depending somewhat upon the weather, and the perfect insect escapes by forcing open a peculiar subtriangular lid at the anterior extremity of the pupa-

rium, a figure of which showing the lid detached we reproduce from Clark's earliest paper (see Fig. 34).

The facts in the life-history above given are for the most part well understood, and there has been little difference of opinion among authorities except as relating to the exact manner of the deposition of the egg. Those who believe that the eggs are thrust into or beneath the skin express a belief admittedly not based upon observation, and contrary to all analogy. That there should be differences of opinion upon a question where observation is so difficult is, perhaps, not to be wondered at. It is extremely difficult to follow the movements of the parent fly on an animal rendered restless or frantic by her presence or her attacks, and it is further quite difficult to discover a single egg concealed by the hair of the animal's back. The manner of placing the egg given by us in the article quoted above is based on experience with warbled cattle in Illinois from 1860–'63, when we were interested directly in stock raising, had charge of some three hundred head of cattle, and had frequent opportunity to examine and study the grubs *in situ* and the habits of the perfect insect.

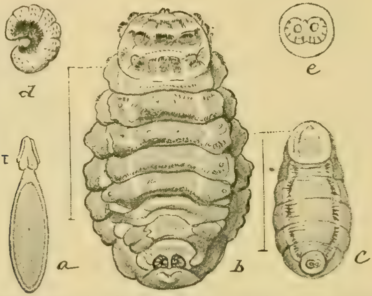

FIG. 33.—*Hypoderma bovis*: *a*, egg; *b*, full-grown larva, ventral view; *c*, puparium, ventral view; *d*, newly hatched larva, side view; *e*, anal stigmata of larva—all enlarged (after Brauer).

It is a long time ago and we made no definite notes at the time, but we believe that we can trust our recollection. Analogy, unity of habit in the family, and structure all confirm it and are against the belief in insertion.

A careful study of the structure of the egg (Fig. 33 *a*), which we have seen in this and in a very closely allied species, the so-called Heel-fly (*Hypoderma lineata*), as well as the descriptions and figures by other authors, show that the grooved and slightly pediceled enlargement of the end which is attached is admirably adapted for being strongly fastened to the skin and to the base of the hairs, and all observations that have been recorded point to the fact that the young larva works its way directly from the egg under the skin, as is the case with other parasitic

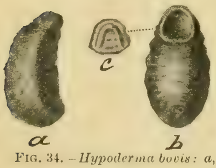

FIG. 34.—*Hypoderma bovis*: *a*, puparium, from side; *b*, same, from below, showing exit hole of adult; *c*, cap which splits off to allow the adult to issue—natural size (after Clark).

Diptera. The structure of the ovipositor clearly excludes the possibility of puncture, for, though horny, it has a blunt trifid tip, and is beset at the end with certain minute hairs, and structure of this character is a very safe guide to habit. Figure 35 is drawn so as to show the telescopic and extensile nature of this organ.

The excitement, amounting often to frenzy, which has been noticed in cattle when the bot-flies are ovipositing, and which has probably led to the idea of stinging, results from the instinctive dread of the fly rather than from any real pain, though no doubt the secretion which so firmly fastens the eggs is accompanied by an irritating sensation. This will account for most of the supposed cases of stinging, including the case of the man-infesting bots. (*Vide* INSECT LIFE, Vol. I, pp. 76 and 226.) In the case of the horse Bot-fly or the sheep Bot-fly, where it is well known that the eggs are not inserted, the animals exhibit a similar dread and nervousness. The fact that the egg has been observed partly extruded from the fly about to oviposit also bears on this point.

Mr. Bracy Clark, in "An Appendix or Supplement to a Treatise on the Œstri and Cuterebræ of Various Animals"* (*Transactions Linnæan Society, London*, 1843, Vol. XIX, pp. 81–94), which treatise was but an elaboration of the paper already mentioned by us, after describing the peculiar noise of the parent fly which is apparently so frightful to cattle, says:

> We may also further observe that there can not be any very painful affliction, as the fly has really no instrument fitted for such a purpose, the feminine ovipositor being a mere tube, made of flexible materials, piece inserted in piece, exactly as in the common telescope. However, it is possible on reaching the skin or cuticle of the beast, which is always highly sensitive in these hairy animals, that it might produce a degree of uneasy tickling, which, added to the noise, and perhaps an instinctive fear, always impressed upon them, is altogether sufficient for the extraordinary alarm we see.

F. Brauer, in his *Monographie der Œstriden* (1863), while stating that the manner of placing the egg is still obscure, does not think that the egg is inserted into the hide. He has found also what he supposed to be the newly hatched larva in the first layers of the skin near the exterior surface.

Miss Ormerod was at first strongly inclined to believe that the eggs are deposited below the skin, but in her latest pamphlet on the subject she says that the egg is probably deposited on the surface, and that the newly hatched maggot makes its way through the skin by means of the sharp, cutting hooks clothing its body surface. In support of this she says:

FIG. 35.—*Hypoderma bovis*, ovipositor of female: *a*, from side; *b*, tip, from below—enlarged (original).

*An essay on the Bots of horses and other animals, London, 1815.

That the jagged-sided channel (not smooth-sided as it would be if pierced by an egg-laying tube) leads in a slanting or straight or curved direction from a little opening at the bottom; * * * also I have found the tunnel partly cut down from the outside, and I have found a small, soft body in it.

The injury occasioned by the presence of these grubs to hides and the diminished quantity and inferior quality of the beef and dairy products were perhaps sufficiently indicated in our notes on this subject in the last number of INSECT LIFE.

The value of the application of various oils both to prevent the oviposition of the fly, and especially to destroy the larvæ, has been long known; and, aside from the discovery that certain substances are more effective than others, little has been added to our knowledge of remedies of late years. Clark, in the articles already cited, fully indicates the good of such applications, and states that Pliny, who was acquainted with these flies, "has recommended for protecting animals from their attacks to annoint them with fats and oils."

In our article, which we have already quoted at length, the use of kerosene was particularly recommended to destroy the larvæ, as well as to deter the fly from ovipositing. In the discussion of remedies by Miss Ormerod, in her various reports, a number of strong-smelling oils are recommended, with which to smear the animals' backs to protect them from the fly. Of these, train-oil or fish-oil—the same that has proved of advantage against the Buffalo Gnat in the South and recently against the Horn Fly in Virginia and Maryland—has been especially recommended. A similar application is the simplest and easiest method of destroying the warbles, which it does by closing the breathing pores on the posterior end of the body. The destruction of the larvæ in this way may be effected by one or two applications in autumn, and is the most satisfactory method of controlling this pest. The appearance of the flies during the entire summer renders operations against these difficult and expensive.

Additional means of protection against the flies are: the use of kerosene emulsion, rancid butter or tar-oil mixed with sulphur, or dry sulphur alone; against the grubs, any of the oily preparations mentioned above, and in addition, the placing of a small quantity of mercurial ointment on the hole in the skin, or of spirits of tar, or carbolic acid; finally, piercing the grub with some sharp instrument or removing it by pressure.

This condensed account of what is known of the habits of this Bot Fly is given partly in compliance with an earnest request from Mr. Alexander, of the *Farmers' Review*, that we take up the question, and partly with a view of showing how little there is to be done by the Department of Agriculture except by extending the inquiry in statistical lines somewhat similar to those followed by him. Even admitting that some more careful observations might be made bearing on the actual mode of oviposition and duration of the egg state, these are points of biologic interest rather than of economic importance.

The point, therefore, to be considered is whether the question of fuller statistical information as to damage done is sufficient to justify national investigation. This can best be answered by stock-raisers and breeders themselves, and where they themselves have not sought or urged such an investigation we should hardly feel justified in spending time and means therefor, considering the large amount of work on hand for which there is pressing demand.

Being thoroughly familiar with the stock interests of the country, we know how difficult it is to get farmers to care for their stock so far as this warble is concerned, and we are satisfied that where self-interest does not dictate better attention, we can do little more than point out the means of avoiding injury and the desirability of so doing.

ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.

FIRST ANNUAL MEETING.

NOVEMBER 12, 1889.

The second meeting of the Association of Official Economic Entomologists was opened by a session held at 11 o'clock in the rooms of the Department of Insects at the U. S. National Museum, the president, C. V. Riley, occupying the chair. The following members were present: C. V. Riley, Washington; S. A. Forbes, Illinois; A. J. Cook, Michigan; J. A. Lintner, New York; Lawrence Bruner, Nebraska; William Saunders, Ottawa; J. P. Campbell, Georgia; C. P. Gillette, Iowa; R. Thaxter, Connecticut; H. Garman, Kentucky; W. B. Alwood, Virginia; Otto Lugger, Minnesota; M. H. Beckwith, Delaware; W. H. Ashmead, E. A. Schwarz, Th. Pergande, M. L. Linell, C. L. Marlatt, Tyler Townsend, and L. O. Howard, Washington.

In the absence of the secretary, Mr. J. B. Smith, Mr. L. O. Howard was nominated and elected secretary *pro tem.*

The minutes of the previous meeting were read, and, with a single exception, approved. Mr. Howard, as a member of the committee on by-laws, read the report of his committee. The report was accepted, and the by-laws read by paragraphs, amended, and adopted, as follows, with the exception of section 2, of Article III, which was laid upon the table for future action:

BY-LAWS.

ARTICLE I.—*Of Members.*

SECTION 1. The classes of members are defined in the constitution, as are their rights to vote or hold office. Members of all kinds have equal privileges as to presentation of papers and in the scientific discussions at the regular meetings, and may, by permission of the presiding officer, speak on business questions before the association.

SECTION 2. All members have equal rights to the published proceedings of the association and to any publications controlled by or distributed by the association, save that should any publications of economic interest be distributed by the association, the distribution lists furnished by the active members are first to be regarded.

ARTICLE II.—*Of Officers and their Duties.*

SECTION 1. It shall be the duty of the president, in addition to the ordinary duties of a presiding officer, to prepare and deliver an annual address, to be delivered at the annual meeting over which he presides.

SEC. 2. It shall be the duty of the secretary to provide the necessary stationery and such books as he may be directed to provide, the expenses for which shall be met by an assessment of not less than 25 cents on the members in attendance at the meetings. The sum so collected shall be used by the secretary to re-imburse himself for advances made and to meet the ordinary expenses of the association. An account shall be rendered at each annual meeting, and if needed, an additional assessment shall be imposed.

SEC. 3. All officers shall be elected by ballot after open nomination, and this by-law shall not be suspended except by unanimous consent of the voting members present.

ARTICLE III.—*Of Meetings.*

SECTION 1. Notice of the time and place of meetings shall be published in all the American entomological periodicals and in INSECT LIFE.

SEC. 2. Special meetings shall be called as provided for in the constitution, and notice of such meetings shall be given by the secretary by mailing to each voting member a formal specification of the time and place of meeting at least two weeks before the date fixed in the notice. The notice shall state the reason for such meeting, and shall specify the business to be transacted, and no other business shall be transacted.

SEC. 3. The order of business at regular meetings shall be, at the first session:

(1) Calling the meeting to order by the president.
(2) The annual address by the president.
(3) Reports of officers.
(4) Reports of committees.
(5) Proposal and election of members.
(6) Written business communications.
(7) Verbal business communications.
(8) New business.
(9) Programme of papers and discussions.
(10) Adjournment.

On the following sessions:

(1) Reading and action on the minutes of previous meetings.
(2) Unfinished business.
(3) Proposal and election of members.
(4) New business.
(5) Programme of papers and discussions.
(6) Adjournment.

At the last session of the meeting the order of business shall be as at other sessions except that after order 5 will come:

(6) Election of officers for the next meeting.
(7) Fixing time and place of next meeting.
(8) Reading and action on rough minutes of the entire session.
(9) Final adjournment.

ARTICLE IV.—*Amendments to By-laws.*

SECTION 1. Changes in these by-laws may be made at any regular meeting in the same manner and on the same notice as prescribed in the constitution for amendments to that instrument.

The association then adjourned until 1.30 p. m.

AFTERNOON SESSION.

The meeting was called to order at 1.50. The following names were added to the list of active members: C. L. Marlatt and Tyler Townsend, of Washington, D. W. Coquillett, California; E. A. Popenoe, Kansas; J. M. Stedman, New York; C. H. Fernald, Massachusetts. The application of A. S. Packard of Rhode Island was referred to a committee consisting of the president and the secretary, with power to act after it shall have been ascertained whether Dr. Packard at present teaches economic entomology.

The following were elected associate members of the association: F. W. Goding, Illinois; T. D. A. Cockerell, Colorado; George D. Hulst, New York.

Arthur E. Shipley of Cambridge, England, was elected a foreign member.

The secretary was instructed in the case of the applications of F. H. Chittenden, of New York, C. L. Eakin, of West Virginia, and George F. Whittemore, of Massachusetts, to inform the applicants that according to the present information of the association they are not entitled to associate membership.

Upon the nomination of Mr. Cook, Mr. F. H. Hillman, of Nevada, and upon the nomination of Mr. Forbes, Mr. John Marten, of Illinois, were placed on the rolls as active members. Upon motion, a committee of three upon programme was provided for, the president appointing Messrs. Howard, Cook, and Lugger.

The secretary, on behalf of the Entomological Society of Washington, invited the visiting entomologists to attend a meeting Tuesday evening at the residence of Dr. William H. Fox, 1826 Jefferson Place.

Mr. H. Garman read two papers entitled: (1) "Notes on a Corn Root-worm in Kentucky;" (2) "The Bordeaux Mixture as an Insecticide." The writer had discovered that the Corn Root-worm of Kentucky is not *Diabrotica longicornis*, but *D. 12-punctata*. He has studied its life history at some length and has discovered that it is double brooded in Kentucky, and surmises that it hibernates as an adult. It affects moist lands much more severely than dry lands, and the previous crop seems to have little relation with the amount of damage, which is contrary to the state of affairs in Illinois with *D. longicornis*. Its work is like that of the allied species, and many fields were found to be severely injured. He described briefly the different stages of the two species and suggested remedies.

In his second communication he described the effect which treating potatoes with the Bordeaux mixture had upon the Flea Beetle and upon the Margined Blister-beetle. His experiments showed that potatoes treated with it were damaged much less by both species than were portions of the crop which were untreated.

In discussing these papers Mr. Riley stated that the transformations of *D. 12-punctata* and its corn-root feeding habits had been known to him for some years, the species being included among the divisional notes at the Department. Mr. Forbes had experienced the same thing in Illinois and stated that in small fields the yield had been reduced 20 per cent. He also had found only one brood in Illinois. He stated the curious fact that occasionally larvæ were found of a red color, in which microscopic examination revealed a Bacillus, which he had succeeded in cultivating and is now growing in culture tubes. The culture medium is stained red, and this is due to a diffusion of color and not to penetration of the Bacillus. Mr. Riley stated that the adults of *Diabrotica* unquestionably hibernate. Mr. Pergande stated that he had found *D. 12-punctata* in the neighborhood of Mount Vernon some years since, feeding very abundantly upon the roots of corn.

Mr. Lintner, in discussing Mr. Garman's second paper, called attention to the distinction between "insecticide" and "preventive measures," and hardly thought that Mr. Garman could call the Bordeaux mixture an insecticide in the case he had mentioned.

Mr. Garman stated that he considered Mr. Lintner's point well taken, and that he was really not certain that the insecticide effect of the mixture was as great as its preventive effect. He had proved, however, upon a small scale in confinement that

it had an undoubted insecticide effect upon the Colorado Potato-beetle. Mr. Riley stated that recently in France he had seen the Bordeaux mixture used upon a large scale, and that its effect could be distinguished at a distance, as it gave the vines a bluish or glaucous appearance. He stated also that it had been found in France that many insects are destroyed by this mixture. He stated that the discovery of the use of the Bordeaux mixture was an excellent illustration of accidental discovery, since, long before the appearance in France of the *Peronospora viticola*, vine-growers in the neighborhood of Bordeaux had used the mixture on the outer rows to deter thieves, and when the disease appeared it was found that the vines thus treated were not affected. He stated that were he a vine-grower he should certainly mix some other insecticide with the mixture, in order to more surely accomplish two results at once.

The meeting then adjourned until 11 o'clock Wednesday morning.

NOVEMBER 13, 1889.

The association met at 11 a. m., President Riley in the chair. The minutes of the previous day were read and approved.

By a special motion it was resolved to omit all personal titles in the minutes.

Under the head of "new business" it was moved and carried, in obedience to a suggestion that such action was desired, that the association co-operate with the Association of Agricultural Colleges and Experiment Stations in so far as to meet with them at 4 o'clock and to report progress.

S. A. Forbes then read a paper entitled "Office and Laboratory Organization." Premising that every laboratory should start with a well-considered and elastic scheme, he described at some length the circumstances of his own work, and his own plan of organization.* In discussing this paper Mr. Riley dwelt upon the subject of simplicity in methods and described the system which he had introduced into the Division of Entomology and the Department of Insects of the National Museum. He believed that, in the case of rapidly accumulating material sent in from all parts of the country, to keep such a record of all accessions and a system of cross-references as described by Mr. Forbes would involve an amount of clerical work hardly justified by the results, and described his methods, particularly in regard to the recording of biologic material.

Parallel with Mr. Forbes' paper, he discussed methods of keeping and cataloguing letters, newspaper clippings, and books.

The topic was then announced for discussion, "Where shall we publish descriptions of new species and results of non-economic observations?" Mr. Lugger stated that at his station he found it impossible to publish anything in the bulletins which was not of self-evident practical importance, and that he was accumulating a great deal of valuable information which thus could not see light.

Mr. Bruner stated that a different condition existed at his station, and that he was obliged to publish such observations and even descriptions of new species, but to insert them as foot-notes.

Mr. Riley read a letter from Mr. C. H. Fernald, of Amherst, objecting strongly to the publication of descriptions of new species in bulletins. Mr. Gillette stated that he was obliged to publish descriptions of new species in the bulletins of his station, his director insisting that the results of all the original work done at the station should first see light in its bulletins. Mr. Cook expressed agreement with Mr. Fernald's letter and offered the following resolution :

"*Resolved*, That it is the opinion of this association that the bulletins of the Experiment Stations and Agricultural Colleges should not contain descriptions of new species."

The resolution was unanimously adopted.

Mr. Forbes moved that the secretary represent the association at the 2 o'clock meet-

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* This paper appears in full in this number, p. 185.

ing of the Experiment Station section and convey the resolution of this association to meet with them at 4. Carried. The association then adjourned until 2.30.

AFTERNOON SESSION.

The meeting was called to order at 2.50.

Mr. Cook offered the following resolution:

"*Resolved*, That a committee be appointed to act in connection with the Association of Agricultural Colleges and Experiment Stations."

After some discussion the resolution was adopted.

Mr. Howard moved that a committee of three, with the president as chairman, should be appointed to report to the section of Experiment Stations at 4, and also to attend the discussion of amendments to the constitution of the general association in order to explain the status of the Association of Official Economic Entomologists.

The topic, "How far shall we recommend patent insecticides and machinery," was announced for discussion. Messrs. Cook, Lugger, Bruner, Forbes, Riley, and Lintner discussed this topic at some length, the joint opinion being embodied in the following resolution, which was offered by Mr. Cook and adopted by the association:

"*Resolved*, That in our opinion we, as officers of the Experiment Stations, should be slow to recommend even by mention any patent insecticide until by analysis and test we find it worthy of recommendation."

The general opinion seemed to be that in case a patent insecticide proved to be thoroughly efficacious and *sufficiently cheap* there should be no hesitation in recommending it.

Mr. Gillette read a paper entitled "Spraying Points," in which he gave certain conclusions which he seemed to have reached by recent experiment. He stated that white arsenic freshly mixed with cold water did less damage to foliage than Paris green, while London purple brought about greater damage than Paris green. Arsenic, however, prepared by boiling, produced a more injurious effect than either of the other substances, which would indicate that it is the arsenic in solution that is to be feared.

Mr. Marlatt called attention to the fact that the different sides of the same tree, according to sun exposure, and difference in the ages of trees, tend to produce different results from spraying. The matter was discussed at some length by Messrs. Riley, Lintner, Cook, and Gillette.

Mr. Gillette read a paper entitled "Codling Moth Experiments," in which he gave the results reached at the Iowa Experiment Station the past season by using a dry application of Paris green in plaster, in the proportion of 1 of the poison to 100 of the plaster; an application of carbolized plaster prepared by thoroughly mixing 1 pint of the crude acid in 100 pounds of plaster, and an application of London purple in water in the proportion of 1 pound of the poison to 128 gallons of water. By estimating the protection in the usual manner it was found that the Paris green and plaster application saved 94 per cent., the carbolized plaster 34 per cent., and the London purple 68 per cent. of the fruit that would have been wormy in the absence or any treatment.

Mr. Gillette then called attention to the fact that nothing like correct results could be expected by figuring out the protection in the ordinary manner except in northern latitudes where the insect is single brooded. The results obtained would be too small. In order to get accurate results the two broods must be kept separate, otherwise the results will be greatly vitiated by the great number of eggs that will be laid upon the sprayed trees by moths flying in from the checks and also by the smaller number of eggs that will be laid on the checks because of the great number of larvæ of the first brood destroyed upon the treated trees in their vicinity.*

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* This paper will appear in Bulletin No. 7 of the Iowa Agricultural Experiment Station.

As the time for adjournment had arrived, the discussion of this paper was postponed until the next session.

The association adjourned to meet at 9 o'clock, November 14

NOVEMBER 14, 1889.

The meeting was called to order at 10 o'clock by Vice-President Cook. The minutes were read and approved.

The secretary read a letter from D. S. Kellicott, who stated that at present he considered himself not eligible to membership.

Under the head of "programme" the chair announced that the discussion of Mr. Gillette's paper of the previous day was in order.

Mr. Forbes expressed himself as of the opinion that, from our present knowledge of the use of the arsenites as insecticides, they can be recommended for use on the peach. In spraying for codlin moth he had not found that any special benefits resulted from spraying for the second brood.

Mr. Cook had found that injury resulted to the peach from the use of white arsenic stirred in cold water.

Mr. Riley, regarding the apparent revulsion of feeling concerning London purple, stated that in his opinion we must be very slow in reversing judgments, carefully formed, of years of experience, and that both London purple and Paris green varied in quality; that their effects varied on different plants, and even in different kinds of weather.

Mr. Bruner presented some notes on *Diabrotica longicornis,* which he had found very abundantly in the city of Lincoln, Nebr., as late as the middle of October. The species is to a certain extent nocturnal in habit, as he had collected 250 at one electric light. The adults feed upon the foliage of radishes and turnips, and have been found about the roots of the wild sun-flower. He has not found it breeding at the roots of corn, but knows that it does so occur in his State. He thinks that it must have some other larval food plant.

In discussing this paper Mr. Forbes stated that he had failed to find this insect breeding upon anything else than corn, although extensive search had been made by himself and his assistants for other larval food plants. He admits that there is a strong possibility that it has other food plants, and Mr. D. S. Harris thinks that he has found it upon Purslane. Mr. Forbes considers the species as normally inhabiting the far West and spoke of its extraordinary increase in Illinois in late years. Twenty years ago Walsh mentioned the finding of three specimens in Illinois as worthy of remark.

Mr. Lugger had found three pupæ of *D. 12-punctata* at the roots of Rudbeckia in a field which had been grown in corn the previous year.

Mr. Garman stated that Mr. D. S. Harris thought that he had also found it upon the roots of Lambs-quarter.

Mr. Riley stated that years ago in Missouri it was very rare, and may be considered as belonging to the class of insects which have changed their habits of late years.

Mr. Bruner had never seen a specimen in Nebraska until within the last two or three years.

The topic of "Co-operation" was then taken up for discussion.

Mr. Lugger suggested that the distribution of beneficial insects was a subject which might enter into a co-operative scheme.

Mr. Forbes stated that he had formulated no distinct plan of co-operation, but that in his opinion there was no objection to duplication of work, but that there were, rather, arguments in favor of it.

The question resolved itself into two heads: How can State workers help each other, and how can the General Government help State workers?

On the latter point he stated that in his opinion the assistance will be comparatively of a technical character in the way of determination of specimens and ref-

erences to literature. As this side of the work is more likely to be overlooked, he would be glad to see a resolution passed commending the technical side of the Government work inentomology to Congress.

Referring to Mr. Lugger's suggestion, he further suggested that the distribution of diseased insects afforded an opportunity for co-operation.

Mr. Riley stated that he felt strongly that an opportunity for co-operation existed in special lines. He thought that a standing committee on co-operation might be appointed to plan definite experiments on mooted questions and to send out authoritative suggestions to station entomologists and to members of the association. He suggested uniform standards and uniform and better correlated results. In regard to the gathering of statistical information, he instanced the case of *Hypoderma bovis,* stating that the work of the Department at Washington could be greatly facilitated by the assistance of different entomologists in their respective localities. The case of the spread of a new pest affords another field, as accurate information of the rate and extent of the spread could be more easily gained by co-operative work.

Mr. Forbes spoke of the concert of observations and report in regard to outbreaks over a wide area, but considered that all arrangements should be flexible and that the work of a formal committee might be cumbersome and slow. He thought that the work might be accomplished by mere suggestion, by letters either from individual workers to one another or from the Department at Washington to the members of the association.

Mr. Lintner thought that it would be desirable and that the members of the association had a right to ask that the Division of Entomology should formulate a plan of co-operation and that the Division itself should also have the right to call for aid on the members of the association. He instanced the Rose Bug as a case where co-operation would be advisable. He had learned from a correspondent in Virginia that the Rose Bugs of a given neighborhood came from a swamp, and he urged that all members of the association in localities where this insect is abundant should endeavor to find whether its breeding places were restricted to sandy or swampy localities.

Mr. Alwood rather dissented from the proposition that the co-operation should be left to correspondence. He thought that the particular charging of a committee with the planning of work would be more effective.

Mr. W. O. Atwater, by invitation, addressed the association and said that the plan adopted by the horticulturists seems to him a very good one, and thought that it would be advantageous to extend the scheme of co-operation beyond the experiment stations and to interest all practical workers in the subject. He dwelt at length upon the necessity of a high scientific ideal.

Mr. Lintner offered a resolution which, after amendment, was adopted in the following form:

"*Resolved,* That a committee of five be appointed by the president, of which he shall be chairman, and which shall consider and report to the next annual meeting upon a method or methods to secure co-operation among the members of the association. It is also authorized to represent the association in conference with any committee on entomology which may be appointed by the Association of Agricultural Colleges and Experiment Stations."

The topic of "amendments to the constitution" was then brought before the association for discussion.

Mr. Forbes moved that the paragraph relative to meetings be amended to read as follows:

"The annual meeting shall be held at such place and time as may be decided upon by the association at the previous annual meeting, and special meetings may be called by a majority of the officers. Eight members shall constitute a quorum for the transaction of business."

Mr. Lintner proposed that the opening paragraph of the constitution be amended so as to read as follows:

"This association shall be known as the Association of Economic Entomologists."

It was moved and carried that section 2 of Article III be taken from the table, and upon motion it was adopted in the following form:

"Special meetings shall be called as provided for in the constitution, and notice of such meetings shall be given by the secretary by mailing to each voting member a formal specification of the time and place of meeting at least two weeks before the day fixed in the notice. The notice shall state the reason for such meeting and shall specify the business to be transacted, and no other business shall be transacted at the special meeting."

The meeting then adjourned to 4 p. m.

AFTERNOON SESSION.

The association reconvened at 4 o'clock; President Riley in the chair.

The committee appointed to report to the Association of Agricultural Colleges and Experiment Stations reported that they had taken no action, as no opportunity had been allowed.

The following resolution was proposed by Mr. Cook and unanimously adopted:

"The Association of Official Economic Entomologists desire to express their hearty appreciation of the generous support afforded the Entomological Division of the Department of Agriculture, as is shown by the publication of bulletins, reports, and INSECT LIFE, no less than the aid which we receive individually through this Division of the Department. We also recognize the great opportunity of the Division to publish monographs, and especially to advance the technical part of entomology. Therefore we wish to express to the Secretary of Agriculture our great desire that all possible aid be given this Division, that such publications may be increased and such valuable work further extended."

The following resolution was offered by Mr. Alwood and adopted by the association:

"*Resolved*, That the committee on co-operation appointed by the Association of Economic Entomologists express a desire to co-operate with the committee on entomology of the Association of American Agricultural Colleges and Experiment Stations."

It was moved, seconded, and carried, that the association hold its next annual meeting at the same time and place at which the Association of Agricultural Colleges and Experiment Stations next meets.

The president appointed as his colleagues upon the committee to submit a plan of co-operation, S. A. Forbes, J. H. Comstock, A. J. Cook, and J. A. Lintner.

It was moved, seconded, and carried, that it is the sense of this meeting that the officers elected at the preliminary meeting should hold office until the second annual meeting.

It was moved and carried that the Department of Agriculture be requested to publish the proceedings of the present meeting in INSECT LIFE.

On motion of Mr. Lintner a vote of thanks was given to the acting secretary.

The association then adjourned.

L. O. HOWARD,
Secretary pro tempore.

OFFICE AND LABORATORY ORGANIZATION.*

By S. A. Forbes, *Champaign, Ill.*

With the sudden establishment of a large number of new offices and laboratories of investigation in a field hitherto very slightly occupied, the subject of special office organization and equipment becomes highly important and interesting, and will become more so as the work of each station increases in scope, difficulty, and complexity. Although I have never been a station worker, in an experience of fifteen years in the gradual development of a natural history institution, in which I began ignorant and alone and which now commonly employs six to eight assistants, I have learned, among other things, the very great importance of having from the first a well-considered and *elastic* scheme of organization, under which the work may grow freely from year to year without *outgrowing* any of the more or less costly equipment of its earlier periods. While an investigator works alone, or with mechanical aids at most, he needs little else, perhaps, but helps to memory; but as soon as he finds himself able and obliged to call in the aid of more or less skilled assistants, the results of whose labors he must be able to command and collate rapidly at will, he finds an elaborate system indispensable. A future of this description I hope we may all at least look forward to; and it is on this ground that I have thought it profitable to describe my own system—tested now by several years' use in a field somewhat more trying, probably, than the average station worker will need to occupy.

The institution to which I refer combines under one management a natural-history survey of Illinois, the work of the official entomologist of that State, and the instruction work of the department of zoölogy and entomology in the State University; and the object of its organization is such a co-ordination of the collections (both determined and undetermined, technical and economic), the collection records, the notes of observations and experiments (whether my own or those of my assistants), the correspondence of the office, and the literature accessible to us, that each and all of these may be readily drawn upon and made completely available for the treatment of any subject whatever which comes within our field.

The essentials are the collections (classified and unclassified), the records, the notes and correspondence, and the library; and the organization consists in an arrangement and orderly analysis of each of these, with a complete system of cross-references from one to another. The collections are, as usual, the reference collections (determined, labeled, and precisely arranged in the zoölogical order) and the miscellaneous, duplicate, and undetermined material, including the economic series; the records are the accessions catalogue and the species catalogue, with card index to each; the notes are on slips, in labeled boxes, classi-

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* Read before the second meeting of the Association of Economic Entomologists, November 13, 1889.

fied in zoölogical order; the correspondence is alphabetically arranged by half years; and the library is arranged in order of subjects and catalogued on cards, article by article, under authors' names, this card catalogue having subordinate subject indexes.

The reference collection in entomology is in excellently made double boxes, usually four specimens representing each species, one bearing a species label, which shows, beneath, the date and locality of the specimen and the name of the person responsible for the determination. The other three specimens have date and locality only, with sometimes a species number, where it is possible that specimens of different but similar species may get mixed by inadvertence in returning specimens to the boxes.

The miscellaneous, duplicate, and undetermined specimens are also in labeled boxes (if dry), all classified, at least to families, each winter, and all bearing a number corresponding to an entry in the accessions catalogue. If the species has been determined, the specimen will also bear a species catalogue number. The alcoholic economic and miscellaneous material is in vials and bottles, closely stored in racks, each vial bearing at least an accessions catalogue number, this series being arranged in numerical order.

The accessions catalogue contains an entry for each time and place at which collections have been made, showing date, place, collector's name, and the general character of the collection, as nearly as it can be conveniently described without determination. This catalogue has also a broad column for cross references to the species catalogue. These accessions catalogue numbers must be placed on every package of specimens received, and, as packages are broken up and the contents mounted, on each specimen, except where these are put into the reference collection, when the data indicated are written out on a label, as above described. All note slips referring to these collections must also make a cross reference to this accessions catalogue; that is, must bear the proper accessions catalogue number. In brief, every specimen, every note, and every entry in the species catalogue must show a reference to the accessions catalogue, and every entry in the latter must finally refer to the species catalogue by as many numbers as there were species in the collection represented by it. These latter references enable one to learn in a moment what any given collection consisted of.

Material intended for the breeding cages is likewise entered and numbered on the accessions catalogue, and this number is placed at the head of the breeding-cage record, kept on slips like the other notes. Whatever specimens are bred are similarly entered, references being made by number to these entries in the body of the notes.

The species catalogue is simply a numbered list of specific names, with references against each entry to all the accessions catalogue numbers representing collections in which the species was found. These references enable one to determine for each species all the dates and

localities of its collection. This catalogue is indexed on cards, alphabetically arranged, each name on a card being followed by numbers corresponding to the various entries of that number on the species catalogue. We also keep up an accessions catalogue index made on a similar plan, intended to give us access to the miscellaneous and unclassified material in our collections.

The result of this arrangement is that no matter at what point one takes up a topic, whether he has before him a specimen, a note slip, an accessions catalogue entry representing date and locality of collection, or a species catalogue name, he can rapidly bring together from the other sources all the material, information illustrating it.

Our notes are all made on single slips of uniform size, suitable for either ink or pencil entries, and each has at the head the accessions catalogue number of the collection to which it refers, followed commonly, for convenience, with a brief general remark sufficing to show the nature of the object mentioned. These notes, as already explained, are in paper boxes, labeled on the edge with the name of the family or other group to which the notes contained apply, and arranged in systematic order, the scheme being a perfectly elastic one, requiring only the insertion of now and then a few new boxes, as the notes under any head become so numerous as to make subdivision necessary. In these boxes are also placed slips bearing brief abstracts of letters which contain important scientific information, with references to the places of these letters in the file.

The library has as the basis of its organization the authors' card catalogue already mentioned, with subject indexes, also on cards, the degree of analysis varying according to the needs of our work. The entries under each author's name being numbered, the references in the subject index are to the author's name and the number of his article.

If I were now to begin a new work, I would at once begin an accessions catalogue of collections, and an authors' catalogue to my library, and would keep my notes on slips, with references to the accessions catalogue entries. The other features of the scheme of organization I have outlined above could then be added as they were needed and as they could be provided for.

EXTRACTS FROM CORRESPONDENCE.

The Mediterranean Flour-moth.

* * * I know of no better means of obtaining information upon economic entomology than through the pages of your most valuable publication. I shall be obliged if you will insert the following notice of the appearance in Canada of the Mediterranean Flour-moth, *Ephestia kühniella*, with the double purpose of putting those concerned upon their guard against this troublesome and extremely injurious insect, and at the same time eliciting from your correspondents as much information as possible as to its occurrence in America. For a year or two it has been giving trouble in some of the large mills and feed-stores in England, and Miss Ormerod has published

a valuable notice and warning to English millers in her last report. During the past summer it has been brought to my notice as a most serious pest in one of our Canadian cities. The outbreak was so serious that our provincial government of Ontario took the matter in hand, and through Dr. P H. Bryce, the secretary of the provincial board of health, have just issued a bulletin upon its operations, appearance in the different stages, and the means which have been adopted to eradicate it before it spreads further. This bulletin, which is written in a manner which will be understood by every one, is most timely, and will, I believe, be attended with very beneficial results.

The milling interests of America are, however, so enormous that it becomes important to make known its appearance here as soon as possible, so that prompt action may be taken immediately a new occurrence takes place.

The following extracts from Dr. Bryce's bulletin will show the gravity of the case. The first is condensed from the account given by the firm in whose mill the insects were observed.

"The first appearance of the Flour-moth we remember seeing was during the month of March, 1889. The moth was seen flying about in the basement of the mill, but little attention was paid to it. In April there was an appearance of a few moths on the different floors of the mill, even at the top. In the month of May we were troubled with a few worms in some of our goods, and in June more of them appeared. In July they increased rapidly. About the middle of July we shut down for a day or so; took the clothing from our bolting reels and cleaned it and washed the inside thoroughly with soft lye soap and lime. We did the same with the elevators. When we started up again every corner and part of the mill had been thoroughly cleaned, as we supposed, and we commenced to work again; but after about four days we found our bolting reels, elevators, etc., worse than before. They were literally swarming with webs, moths, and worms, even inside the dark chambers of the reels. We shut down again and made a more thorough cleaning by washing, etc. While this was going on we found there was no use to try and clear ourselves of the pest, as the mill walls, ceilings, cracks, crevices, and every machine was completely infested with moths, cocoons, and caterpillars, and there was no use going on."

Eventually the firm had to vacate their premises and build a new mill.

Dr. Bryce continues upon page 11 of the Bulletin, after detailing its habits, as follows:

"From the foregoing it will be apparent that the moth may not only be transported from one place to another in any one of its various stages, but that search for its presence in any one or all of these must be made where its presence is suspected. It will at once be seen how great are not only the dangers of its transmission from one mill to another and one locality to another, but also how many are the difficulties attaching to its detection, while as yet only a few individuals may have been introduced into a warehouse or mill. With what rapidity the *Ephestia kühniella* develops under favorable conditions, nothing will better illustrate than the correspondence of a sufferer therefrom already published. When it is stated that a large warehouse, some 25 feet wide, 75 feet long, and four stories high, became literally alive with moths in the short course of six months, while thousands upon thousands of the cocoons were found adherent to the walls, joists, posts, ceilings, and in every nail-hole, cracks in floors, partitions, machinery, and furniture throughout the whole building; while in sample boxes of cardboard, in small and large bags, in flour stored anywhere throughout the building, it was abundantly present, it will be understood what millers have to expect to encounter if they neglect the most vigorous measures to destroy the first moths which at any future time may appear on their premises. To illustrate further the difficulty of overcoming the pest, once introduced, it may be stated that several men have been at work in the building from which our correspondent has removed his machinery, for over a fortnight in burning all woodwork, as flooring, fixtures, etc., sweeping down walls and destroying the rubbish, the walls thereafter

having to be washed down and the floors scrubbed with disinfectants; while during the process many pounds of sulphur have been burned in order that the fumes may aid in the work of destruction."—[James Fletcher, Ottawa, Canada, October 31, 1889.

Spider Bites—Two Ceylonese Cases.

Since reading your several notices of spider bites in America, two cases have come under my own observation. In both cases the patients (Tamil coolies) were bitten on the hand by the large, hairy spider, *Mygale fasciata*, while working in the field. Both patients complained of recurring spasms followed by soreness and muscular pains extending through the leg, arm, and neck on the affected side. The local medical officer applied, in one case, fuming nitric acid to the puncture, and in the second case injected permanganate of potassium. This second treatment seems to have been the most successful, the painful symptoms abating in a much shorter period.—[E. Ernest Green, Eton, Punduloya, Ceylon, October 5, 1889.

Scent in Dung-beetles.

I have just returned from gathering a load of moss (*Sphagnum*) out of a swamp miles in extent, where I saw a most remarkable illustration of the power of smell in insects. The day was mild and still, and there in the midst of the swamp the excrement of my horse attracted a large number of the small dark scavenger beetle, about the size of a horse-fly, so common in cleared lands at this season of the year. They all came from the direction of the higher land. I have long been of the opinion that the power of scent was stronger in insects than in any other department of animated creation. * * * —[W. W. Meech, Vineland, N. J., October 18, 1889.

Beetles from Stomach of a "Chuck-wills-widow."

I send by mail some "bugs" taken from the stomach of a Chuck-wills-widow. Please state name, and whether injurious to agriculture.—[G. H. Ragsdale, Gainesville, Cook County, Tex., May 12, 1886.

REPLY.— * * * I beg to acknowledge the receipt of yours of recent date, accompanied by insects taken from the stomach of the Chuck-wills-widow (*Antrostomus carolinensis*). This bird has a curious habit of bolting these large beetles whole while on the wing. There are two species in your sending. One is *Ligyrus gibbosus*, a species the larva of which feeds upon the root of sunflower, and which has been recorded as doing considerable damage in Nebraska, where the sunflower is grown as a crop; the other is *Lachnosterna rugosa*, a southern representative of the common May beetle of the north. The larva of this insect is a white grub and doubtless feeds on the roots of grass and similar vegetation.—[May 18, 1886.]

A Harvest-mite Destroying the Eggs of the Potato-beetle.

I send you inclosed in small box a specimen of an insect found by me feeding upon the eggs of the Colorado Potato beetle. I have been troubled every year a great deal by the ravages of the slugs, but this summer there are none upon my vines, though the usual number of old beetles are seen depositing their eggs. This insect may be as common as the house-fly, but he is new to me, and has won my gratitude. Perhaps you may be interested in him, but if not no harm will be done in placing him before your notice.—[Charles C. Bryant, Silver Lake P. O., Kingston, Mass., June 18, 1886.

REPLY.— * * * The insect which you found feeding on the eggs of the Colorado Potato-beetle is a Harvest-mite of the genus *Trombidium*. It appears, so far as I can ascertain, to be a new species, and consequently we should be very glad to receive further specimens. Is it at all common with you? I think that no record has been published of the work of any Harvest-mite upon the eggs of the Potato-beetle, and in consequence your letter possesses considerable interest. * * * —[June 22, 1886.]

Supposed Injury to Grass from Gastrophysa polygoni.

Please to inform me as to the inclosed insects. A few days ago they made their appearance in great numbers in the court house yard, and are destroying the grass very rapidly.—[N. R. Smithson, Winchester, Ill., June 2, 1887.

REPLY.— * * * This beetle is known as *Gastrophysa polygoni.* It is a perfectly harmless species, injuring no crop and feeding solely upon the weeds of the genus *Polygonum* (knot-weed, joint-weed, goose-grass, door-weed, smart-weed, etc.) which grow among the grass in lawns. * * * I know of no recorded instance of such a habit, and your observation therefore becomes interesting if true. Will you therefore please advise me whether you are not mistaken, and whether the insect does not feed upon some one of the weeds mentioned among the grass, rather than upon the grass itself?—[June 7, 1887.]

Damage to dead Trunks of Pine by Rhagium lineatum.

I send you by mail to-day specimens of the Pine-tree Borer, as requested in your letter, which bids fair to exterminate our pine trees. If you have any remedy to advise, would be glad to hear from you.—[E. R. Memminger, Flat Rock, N. C., September 8, 1888.

REPLY.— * * * The insects sent are *Rhagium lineatum.* This species does not kill the pine trees, but simply bores beneath the bark and into the decaying wood of trees that have been killed by some other cause, or dead portions of live trees. It also attacks spruce and fir logs, stumps, and dead standing trees. In case it should become destructive to logs which have been cut for timber, it can be destroyed by stripping off the bark and portions of the sap-wood infested.—[September 13, 1888.]

Some Vedalia Letters.*

* * * The Vedalias that you brought to my place about the 20th of last March, and which we colonized on four large orange trees that were covered with Fluted Scale, have spread in all directions, although to begin with they followed the direction of the wind most readily. From those four trees they have multiplied so rapidly that in my orchard of 3,000 trees it is seldom that we can now find a Fluted Scale. I find a few of them on some weeds in spots, but I can also find the beetles there. The trees have put on a new growth and look altogether different; even the black fungus on the old leaves has loosened its hold and begins to fall to the ground. Besides having cleaned my orchard, they spread also to the orchard of my cousin and to my father's orchard; the latter was also re-enforced by colonies from Mr. J. W. Wolfskill and from Col. J. R. Dobbins. As my father has some 10,000, trees, and most all were more or less infested, the Vedalias had a grand feast ahead of them, and they have done their work most wonderfully. What I have said of my orchard applies to my father's also, and really to all our neighbors. When the Vedalias first began to multiply we took colonies of fifty or more in the pupa state and placed them in different portions of the orchard, and even had we not done so the Vedalia unaided would itself have reached there in almost the same time.

On the Chapman place the Vedalias have cleaned the Fluted Scales off of the 150 acres of land. They have taken more than an oppressive burden off of the orange grower's hands, and I for one very much thank the Division of Entomology for the *Vedalia cardinalis*, the insect that has worked a miracle.—[A. Scott Chapman, San Gabriel, Cal., October 18, 1889.

* * * The Vedalia had practically freed my orchard of Iceryas on the 31st of July. It was on that date that I was obliged to post a notice at the entrance to my place, saying that I had no more Vedalias for distribution. The scale and lady-bird

*These were addressed to Mr. Coquillett, at Los Angeles.

had fought out the battle, and while the carcasses of the vanquished were everywhere present to tell of the slaughter, the victors had disappeared almost entirely from the field. I have 35 acres in orchard—some 3,200 trees in all. I never colonized any Vedalias in my grove, excepting the two consignments which you brought to me yourself—one box on February 22 and two boxes March 20. I noticed the first increase from the lot No. 1 on the 15th of April, and from lot No. 2 on the 24th of the same month. On the 25th of April I found larvæ upon several adjacent trees. These facts are from memoranda made at the time. I have a list of the names of fruit growers, 226 in number, to whom I personally distributed over 120,000 Vedalias in colonies of various sizes between May 31 and July 31. * * * —[J. R. Dobbins, San Gabriel, Cal., October 22, 1889.

I am glad to report that the lady-birds you sent me are doing good work and increasing in this neighborhood, and as soon as all are supplied I will establish some on the mountain where the brush is full of them, also a small patch near the Ocean, and hope the Cottony Cushion-scale will soon be a scarce article in this section.—[Joseph Sexton, Goleta, Cal., August 12, 1889.

On Hæmatobia serrata.

I have just received INSECT LIFE, No. 4, Vol. II, for which please accept my most sincere thanks.

On page 95 I find a passage which calls, on my part, for the following statement:

On receiving the specimens of *Hæmatobia serrata* from Dr. Lintner in September, 1888, I at once suspected that they might be specifically identical with some European Stomoxid, and I communicated them for identification to my friend, Mr. Kowarz. He answered as follows:

"Ich habe mir alle Mühe gegeben, aber ich vermag in dieser Fliege nichts anderes als *Hæmatobia serrata* R. D. (*Lyperosia* Rnd.) zu erkennen. Sie unterscheidet sich von den europäern nicht im Geringsten."

Translation: "I have taken great pains with this fly and can not recognize in it anything but the *H. serrata* R. D. (*Lyperosia* Rnd.). It does not in the least differ from the European specimens."

It is important, in such a case, to have it distinctly stated that the identification is based upon an actual comparison of specimens by the best authority. Mr. Ferdinand Kowarz, in Franzensbad, Bohemia, I consider as the entomologist who, at present, possesses the most extensive knowledge and experience of European Diptera, especially so far as the discrimination of species is concerned. I take, therefore, his decision as trustworthy and final, and I regret that Dr. Lintner did not mention Mr. Kowarz's name in the first publication which he made upon receiving my answer (in the *Country Gentleman*, Albany, N. Y., November 29, 1888).

My own knowledge of European Diptera is very insufficient, and in all doubtful cases I apply either to Mr. Kowarz or to Professor Mik, or, for Cecidomyiæ, to Dr. Franz Löw (the two latter in Vienna).

You will do me a favor by the publication of this letter in one of your next numbers.—[C. R. Osten Sacken, Heidelberg, November 20, 1889.

GENERAL NOTES.

OVIPOSITION OF TRAGIDION FULVIPENNE.

A desirable addition to our knowledge of the life-history of *Tragidion fulvipenne* is made by Prof. E. A. Popenoe, in a paper entitled "Note on the oviposition of a Woodborer," read at the Wichita meeting of the Kansas Academy of Science, and published in the Manhattan *Industrialist* for November 2, 1889. The *Cerambycidæ*, as Professor Popenoe points out, ordinarily oviposit in cracks of bark or in fissures made by the parent insect, and hence the striking variation in this habit in the case of the above-named beetle is the more interesting.

Female beetles only were observed about a wood-pile on warm days about the end of September, and after considerable search they were seen ovipositing on sticks, probably on the chestnut oak. The habit of the insect in this particular is described as follows:

When detected in oviposition, the females were standing on the smooth bark, transversely to the stick, their bodies close to the surface, their antennæ bent under at the tips, which were touching the bark, and the broad tip of the abdomen closely appressed to the surface over which the insect stood. The close contact of the motionless tip of the abdomen to the bark prevented my noting the exact mode of placing the egg, and presently, becoming somewhat impatient, I lifted a beetle from position, and, to my surprise, instead of an opening in the bark as I had anticipated, I saw a tubercle simulating so closely in appearance and color the corky outgrowths common on the bark of the chestnut oak that I was at first inclined to believe it one of these, and to question the purpose of the female in maintaining so long the position described. On an examination of this tubercle, however, I found it to be hollow, and within it, lying on the bark, with no puncture or abrasion in the latter to be seen, was an oblong egg of a translucent, dull white surface, smooth and without markings, so far as I could see with a pocket triplet of good definition. This egg was sufficient in size nearly to fill the hollow tubercle, or egg-case, as I may now call it. The egg-case is rather regular, ellipticle, strongly convex, measuring about one-sixteenth of an inch in length. Under the microscope, the case appears on the surface to be made up of scales of the thin external layer of the oak bark, intermingled with glistening particles, as of dried mucus.

INSECTS INJURING THE TEA-PLANT IN CEYLON.

We have recently received from Mr. E. Ernest Green of Eton, Punduloya, Ceylon, a series of nine short articles on the "Insect Pests of the Tea-plant" published in the *Ceylon Independent*, July 3 to October 3. The papers are illustrated by engravings made by a native from drawings by Mr. Green and, while naturally not of a high state of art, are plain and characteristic. The pests treated are as follows:

THE FAGGOT WORM (*Eumeta carmerii*).—This insect is one of the Bag-worms, and its popular name is derived from the fact that its case resembles a bundle of minute faggots. The life history is very similar to that of our common Bag-worm (*Thyridopteryx ephemeraeformis*). Mr.

Green quotes a quaint native legend concerning these insects, to the effect that in a previous life they existed in the human form, when amongst other crimes they made a regular trade of stealing fire-wood; at their death their souls were sent into the bodies of insects and condemned to perpetually carry about with them a faggot of wood. This species is also found on the coffee plant.

THE BORER (*Zeuzera coffeæ*).—This insect which has been so frequently treated as a coffee enemy and so known to planters as the "Red Borer" is by no means uncommon as a borer of the tea-plant. It belongs to the *Cossinæ*.

THE TEA BARK-LOUSE (*Aspidiotus theæ*).—This is one of the most serious enemies of the plant and is very noticeable at the time of pruning.

THE YELLOW BARK-LOUSE (*Aspidiotus flavescens*).—This is a smaller species than *A. theæ*, but is much more readily recognized on account of its yellow color contrasting with the bark, while *A. theæ* is of the same color as the bark.

THE TRANSPARENT-SCALED BARK-LOUSE (*Aspidiotus transparens.*)—This species has been noticed only in small numbers and prefers the leaf to the bark. The scales are small, round, and colorless, and the insects can be plainly seen beneath them.

THE LOBSTER CATERPILLAR (*Stauropus alternus*).—This is a large leaf-feeding species, and when five occur upon a single plant the leaves become completely devoured. It is a close ally to the Lobster Caterpillar of Europe, *S fagi*.

THE RED TEA-MITE OR RED SPIDER (*Tetranychus biaculatus*).—This mite produces a copper sunburnt appearance of the leaves and it will be remembered as having previously been described by Mr. Wood-Mason as affecting the tea-plant in Assam. Mr. Green thinks it identical with the species described by Mr. Nietner as the "Red Spider of the coffee tree (*Acarus Coffeæ*)."

THE FIVE-LEGGED TEA-MITE (*Typhlodromus carinatus*).—This species, Mr. Green says, is closely related to the Rust-mite of the orange (*T. oleivorus* Ashm.) which feeds on both sides of the leaf, while the Red Spider is confined to the upper surface. He advised one part of kerosene emulsion to eighty parts of water, or one part of Phenile to two hundred and forty parts of water.

THE YELLOW TEA-MITE (*Acarus translucens*).—This mite produces the condition called "sulky" and feeds upon the buds. The living insects can be found only upon the bud and the underside of the two following leaves, and as each fresh bud opens the colony moves higher up, deserting the lower leaves, but these remain injured and always retain the marks of the insects. Excepting the Tea Bark-louse Mr. Green considers this to be the most serious pest to the plant. He thinks that the systematic destruction of all tea prunings while still green would prove an immense check to this pest and others.

A NEW WAY OF USING CARBON BISULPHIDE.

We have not yet seen any notice in this country of the point brought out by the president of the Lyons Viticultural Society in a recent address to the effect that vaseline is not only an excellent solvent of bisulphide of carbon, but that it also produces the power of penetrating the soils and of woody tissues in a most remarkable manner. Bisulphide after having been taken up by vaseline liberates itself progressively and then vaporizes. The action of the vapor is thus prolonged through many days. The strength of these vapors is far less than if the bisulphide be used alone, but the effect is of much greater duration. In warm climates, where if the bisulphide were used alone the vaporization would be exceedingly rapid, its use with vaseline will be of great benefit, although adding somewhat to the expense.

RANGE OF PYRALIS FARINALIS.

As is the case with other insects of similar habits, this common Mealworm Moth is very widespread. The British Museum Catalogue in 1858 records it from England, Germany, the whole of Europe, Madeira, United States, Nova Scotia, South Africa, Cape of Good Hope, and Australia. We mention it at this time for the reason that Mr. J. G. O. Tepper in his papers on "Common Native Insects," published in the *Garden and Field* of Adelaide, South Australia, states that this moth is very commonly met with in out-houses, kitchens, and even on trees in the field. He says:

> Whether it is native or introduced is hard to say, as the writer already met it about April, 1854, as commonly as now in the country.

It seems to us that it is without much question an European species imported into Australia and the rest of the globe, as it was noticed by the older Geoffroy and by Linnæus.

KIND WORDS FROM ABROAD.

Mr. A. M. Pearson, chemist to the Department of Agriculture of Victoria, in a lecture on "Science and Farming," published in Bulletin No. 3, Department of Agriculture at Melbourne, makes use of the following expression:

> Science has also lent its aid in the direction of overcoming plant diseases and insect pests, and I think it must be acknowledged that the Americans, more especially the Department of Agriculture at Washington, have taken the lead in this direction.

ON SOME GALL-MAKING INSECTS IN NEW ZEALAND.

Under the above caption Mr. W. M. Maskell has published a short paper in the *Transactions of the New Zealand Institute* for 1888, in which he describes certain galls upon *Olearia furfuracea*, a native shrub, known by the settlers as "Ake-ake," and by the Maories as "Ake-piro." Mr. Maskell has reared from the galls a dipterous insect and a hymen-

opteran. In referring to the latter insect, which he calls *Eurytoma oleariæ*, he states that while it seems likely that this insect is a gall-producer, it may be only a messmate of a Cecidomyia, as its larvæ and pupæ are found mixed indiscriminately with those of the Cecidomyia, although in separate cells. He inclines to the belief that the Cecidomyia produces the galls and that the Eurytoma makes use of them as a residence. In considering this question he refers to the Joint Worm as *Eurytoma hordei*, and states that it is not certain that it is phytophagous, but that it may be only parasitic upon the larva of Cecidomyia. In this remark Mr. Maskell is behind the times, as there is no longer any question of the phytophagous nature of this species, but his greatest mistake occurs in the identification of the insect which he considers a Eurytomid. As his figures show, it is not an Eurytoma, and does not even belong to the family *Chalcididæ*. Specimens which he has kindly sent us show that it is a Proctotrupid of the subfamily *Platygasterinæ*, and belonging to the genus *Monocrita*. This identification of the insect renders it quite certain that it is a parasite.

VERTEBRATE ENEMIES OF THE WHITE GRUB.

Prof. C. W. Hargitt, of Miami University, in an article on the White Grub, contributed to the Oxford (Ohio) *News* of April 6 last, gives from his personal observations some interesting notes upon the subject of this note. He finds that the crow is among the most active and constant enemies of this insect.

> His presence in flocks, promenading pastures and meadows, is almost wholly due to his taste for this pest, as has been abundantly proved by an examination made upon the stomach and crop.

The robin and the blackbird he states to be hardly less active as devourers of the grub.

He also cites the sparrow-hawk, king-bird, jay, and the golden woodpecker as of less importance.

Among mammals he cites the mole and the skunk, while dissections of frogs showed several grubs and many adult beetles. In a single frog stomach six full-grown May-beetles were found.

NEW METHOD OF DESTROYING SCALE-INSECTS.

We understand that a patent has been issued to Mr. Edwin P. Fowler, of National City, Cal., for a process of dislodging and destroying scale-insects by means of a sand blast. We have been acquainted with the fact that this application was before the Patent Office for some time, but have been unable to publish anything concerning it pending its consideration. The plan is an ingenious one, but whether it will pay or not is a matter for future experiment. A fan-blower or other apparatus capable of creating an artificial current of air is employed; the current is directed against the tree, and in its transit from the fan is charged with sand. The force of the current is carefully gauged and the sand may be heated.

DR. FRANZ LÖW.

It is with profound regret that we have just received from his brother the sad news of the death of Dr. Franz Löw, which took place at Vienna, Austria, November 22, after a long and painful illness. With him entomological science loses a conscientious worker, whose labors have greatly added to the common stock of knowledge, and his premature death (he died in his sixty-first year) will everywhere be felt as a calamity.

His first entomological paper was published in 1857, and treats of the larvæ of the Coleopterous genus *Nebria*, but he soon became more interested in the life-history of gall-producing insects, especially *Diptera*, *Homoptera*, and *Acarinæ*. Of his numerous papers on this subject, published mostly in the Proceedings of the Zool.-botan. Society of Vienna, every one marks an addition to our knowledge. This is especially true of the classification and life-history of the *Psyllidæ*, and he became the recognized leading authority on this intricate group of insects. Notwithstanding the works by Flor and Thomson, the classification of *Psyllidæ* had remained practically where Förster left it in 1848, and Löw's paper, "Zur Systematik der Psylloden," published in 1879, marks the first genuine progress since that time. Some years previously he had pointed out the great importance of the study of the earlier stages of *Psyllidæ* to a thorough understanding of this family, and his numerous contributions to this subject show how indefatigable he was in tracing and describing them.

Dr. Löw will also be remembered as the author of several valuable papers on Myiasis, and as one of the collaborators on the Zoologischer Jahresbericht from 1883 to 1885. Personally we shall greatly miss him as one of our most valued European correspondents, always ready to assist with suggestions and criticisms given in the most amiable and unpretentious way. He took a keen interest in American entomology; and it was a delightful (if often difficult) task to answer the many knotty questions he plied us with in his letters regarding all sorts of insects, especially those treated of or described by the older authors.

EUGÈNE MAILLOT.

We also deeply regret to learn of the death of another valued friend and correspondent, Maillot, director of the silk station at Montpellier. Maillot was a man of great scientific ability, and was, at the same time, an eminently practical man. He was studying the different races of silk-worms from all parts of the world at the time of his death, and had contributed in a large measure to the general adoption in France of the microscopic selection of silk-worm eggs as a preventive against pébrine. He was a student of Pasteur's, and a comparatively young man. His work entitled "*Leçons sur le ver à soie du Murier*," from a theoretical and practical point of view, is one of the best treatises upon sericulture which has been written up to the present time.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The fifty-sixth regular meeting of the Entomological Society of Washington, D. C., held November 12, 1889.

Mr. F. M. Webster and Dr. John Hamilton were elected corresponding members of the society.

Mr. Howard exhibited a specimen of *Xylonomus rileyi* Ashm., taken on the Washington Monument.

Mr. Lugger read some notes on "The migration of the Archippus butterfly," and gave an interesting study of their spring and fall movements. He also noted a similar migration of *Vanessa cardui.* Dr. R. Thaxter stated in discussion that he had found Archippus wintering along the Gulf of Mexico in immense numbers.

Mr. Howard read a paper on "A few additions and corrections to Scudder's Nomenclator Zoologicus."

Mr. Marlatt gave some "Notes on the abundance of oak-feeding lepidopterous larvae this fall," and named twelve species of macrolepidopterous larvae taken in the course of about an hour.

Mr. Schwarz read a paper entitled "Caprification," and gave a thorough résumé under the following heads:

(1) The flower and fruits of the Capri fig and the wild species of Ficus.

(2) Enumeration of the fig insects and difficulties of study.

(3) Life history of true fig-insect (Blastophaga) and fertilization of wild species of Ficus and the Capri fig; and

(4) The true fig tree and the process of caprification.

Mr. Townsend read a paper on "The fall occurrence of Bibio and Dilophus," in the discussion of which it was conceded that the autumnal occurrence was simply due to an acceleration of development, as they hibernate in a nearly developed state.

WM. H. FOX, M. D.,
Recording Secretary.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. (Double number.) January and February, 1890.

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INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE.

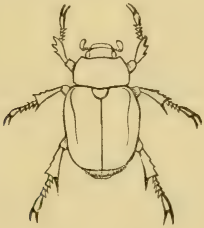
EDITED BY

C. V. RILEY, Entomologist,

AND

L. O. HOWARD, First Assistant,

WITH THE ASSISTANCE OF OTHER MEMBERS OF THE DIVISIONAL FORCE.



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SPECIAL NOTES.

A descriptive Catalogue of the Phalangiinæ in Illinois.—We have just received from Mr. C. M. Weed a paper with the above title published as a bulletin of the Illinois State Laboratory of Natural History (December, 1889), and also a partial bibliography of the same group as represented in North America. The descriptive catalogue includes the consideration of three genera and ten species, two of the species being new. *Liobonum dorsatum*, *L.* (?) *formosum* and *Oliogophus pictus* are figured. The bibliography includes five titles and fifty-eight references to descriptions of species. We are glad to see this neglected group worked up so satisfactorily.

Entomological News.—The Entomological Section of the Academy of Natural Sciences, of Philadelphia and the American Entomological Society announce the publication of a new journal to be devoted to notes and news, queries and answers, exchanges and doings of societies. It is edited by Mr. E. M. Aaron, assisted by an advisory committee consisting of Dr. G. H. Horn, Mr. E. T. Cresson, Dr. Henry Skinner, and Mr. Ph. P. Calvert. The subscription price is $1 a year, and ten numbers will be published, one for each month, with the exception of July and August. It began publication January 1, 1890. The main object of the journal, as stated in its circular of announcement, will be to keep entomologists acquainted with what is being published in serials at home and abroad, and it will also give news items concerning explorations and collectors. The journal will meet a present want and will be welcomed by American collectors. Backed by the American Entomological Society its success would seem to be assured.

Dr. Lintner's latest Report.—Dr. Lintner's fifth report on the injurious and other insects of the State of New York has been received. It is extracted from the forty-second report of the New York State Museum of

Natural History. It comprises nearly two hundred and fifty pages of very interesting matter and is illustrated by fifty text figures. The matter is prepared with Dr. Lintner's usual great care and contains valuable summaries of our information upon a large number of injurious insects. The consideration of each species is prefaced by a synonymical and bibliographical table which is of great value to the working entomologist. The principal articles are upon Remedies and Preventives, the Larch Saw-fly (*Nematus erichsonii*), the Cow Horn-fly, the Elm Leaf-beetle, and the Grain Plant-louse. Short accounts are given of other species, and under the head of "Insect Attacks" and "Miscellaneous Observations" many interesting notes are collocated. A small section of the report is devoted to Acarina and Myriapoda in which several injurious and beneficial mites are mentioned. In an appendix a list of the principal publications of the Entomologist during 1888 is given. We can commend Dr. Lintner's writings for the care with which quoted information is credited, and wish we could say the same regarding his illustrations, which are often used with no such regard for authority or source.

The Little Red Ant.—We publish in this number a free translation of an interesting article by M. A. Bellevoye on this insect. It will be interesting in connection with our article (Vol. II, No. 3) on the occurrence of this insect in America. Mr. Bellevoye's suggested inference that inasmuch as he was unable to observe that the ants carried any food to their nests this might be considered a result of domestication, as they always find something to feed upon in our houses, will hardly hold for this side of the water, as in our experience these ants are often seen carrying particles of food into cracks in walls and floors which probably lead to their nests.

Technical Entomology in Ohio.—The Ohio Agricultural Experiment Station has started an innovation in the line of a series of technical bulletins. The director explains in an obscure foot-note that the series is intended to embody the technical results of the work of the station, but that it is not expected that they will be of direct service to farmers in general. It is hoped, rather, that they may be found useful by workers in other stations, and thus indirectly serve the cause of agriculture. It comprises three articles by the entomologist, Mr. C. M. Weed, entitled (1) "Preparatory stages of the 20-spotted Lady-bird," (2) "Studies in Pond Life," and (3) "A Partial Bibliography of Insects affecting Clover." Of these articles, the one upon "Studies in Pond Life" is naturally of the greatest interest and value, and a number of new points are brought out. The "Larger Typha-borer" (*Arzama obliquata* G. and R.) is figured in larva, pupa, and imago, and he records a number of dates of transformation, and describes the larva and pupa.

"The Toothed-horned Fish-fly" (*Chauliodes rostricornis* Ramb.) is figured in the larva, pupa, and adult, and notes upon its life-history are given, adding, however, little to the observations recorded by Walsh in the second volume of the proceedings of the Entomological Society of Philadelphia. The Sagittaria Curculio (*Listronotus latiusculus* Boh.) is also figured in the larva, pupa, and adult, and its breeding habits, and the leaf and stalk and seed heads of the common arrow-leaf are described. The Lesser Water-bug (*Zaitha fluminea* Say) is stated to feed mainly upon the early stages of Dragon Flies. It also uses as food univalve snails and May-fly larvæ. *Notonecta undulata* is recorded as feeding upon May-fly larvæ and upon a species of Boatman (*Corisa alternata* Say). *Donacia subtilis* Kunze feeds upon a number of aquatic plants and pollinizes *Nuphar advena.* His observations indicate that the 13-spotted Lady-bird (*Hippodamia 13-punctata*) has aquatic tendencies, as he has commonly found it upon the leaves of aquatic plants. This accords with our own experience, and Mulsant mentions the same thing of this species in France. The stages of *Benacus griseus* and *Belostoma americanum* are described and those of the former species are figured. Altogether this is one of the best and most interesting (entomologically) of the experiment station bulletins so far issued.

Ultimate Larva of Platypsyllus.—We copy in the present issue from *Entomologica Americana* for February the description of an interesting larval form of this curious and anomalous beaver parasite, and would again call attention to the wonderful superficial resemblance to certain Mallophaga of the genera *Nirmus* and *Trichodectes.* In some species of the latter genus the mandibles are bidentate, as in this larva, while the caputal characters, the loss of the anal cerci, and the general form of body so depart from the earlier larva that the resemblance to the Mallophaga is still more striking. But none of the lice have the mouth-parts, otherwise, as in this larva, nor the single jointed tarsus.—C. V. R.

Oviposition of Hypoderma bovis.—The interesting facts narrated in this number by Dr. Cooper Curtice bring unexpected confirmation of what we stated in the last issue as to the eggs of this Ox Wormal being fastened externally, and would seem to indicate that, exceptionally at least, if not normally, the newly-hatched larva is taken in through the mouth and can live internally during the first stage. Whether these young larvæ in the œsophageal walls and under the pleura eventually perish or succeed in working beneath the skin is as yet to be ascertained, but we see nothing improbable in the latter course. These young larvæ are doubtless taken from one animal to another through the habit which cattle have of licking each other, and it is possible that in older cattle in which the hide is thick this mode of entrance of Hypoderma is more common than in younger animals. We have examined Dr.

Curtice's material and can corroborate the correctness of the determination. In this connection we also draw attention to the interesting communication of Dr. Elizabeth R. Kane (p. 238) relating to the traveling propensities of the young Hypoderma larva.

THE USE OF HYDROCYANIC ACID GAS FOR THE DESTRUCTION OF THE RED SCALE.

By D. W. Coquillett, *Los Angeles, Cal.*

In my reports to Professor Riley for the years 1887 and 1888, published in the annual reports of this Department for these years (pages 123 to 142, and 123 to 126 respectively), I gave an extended account of the use of hydrocyanic acid gas for the destruction of scale-insects (family *Coccidæ*); and I am not aware that anything has been published upon this subject since the appearance of the above-mentioned report for the year 1888. On page 126 of this report I gave an account of treating several orange and lemon trees with this gas, and the latest report given of the condition of these trees was under date of August 15, 1888; under date of February 17, 1889, the owner of the trees, Mr. I. L. Collins, wrote me as follows in regard to them:

Dear Sir: I received yours of the 15th inst. asking about the condition of the lemon and orange trees treated with the gas. These trees are in a much better condition than those around them, as they have a full foliage while the others are nearly bare; what fruit they have on is comparatively clean, there being but few red scales on them. They already show that the coming season they will bear quite heavily, but now they have enough red scales on them to ruin them in a year. We expected that the scales would come on them again from the other trees, these not having been treated with the gas; I did not think the tops worth saving, so did not treat them with the gas. I will cut off the tops, as almost everybody else is doing, and will wash the stumps with a solution composed of 30 pounds of resin, 7 pounds of caustic soda or potash, and one gallon of fish oil to 100 gallons of water. The trees treated with the gas remained perfectly clean for over a month; then we found scales on the outside branches, having apparently been carried there by the horses in cultivating.

In accordance with a written request from several of the orange growers of Orange, I went down to that place in the latter part of September of the present year, and conducted a series of experiments with hydrocyanic acid gas for destroying the Red Scale, with the view of trying to discover some simpler and less expensive method for producing and manipulating this gas than the one heretofore in use. The lemon trees experimented upon and also the fumigating outfit used in making these tests were kindly placed at my disposal by their owner, Mr. A. D. Bishop; and the latter gentleman, in conjunction with Mr. A. H. Alward, also aided me in moving the outfit from tree to tree when making the tests. Among the different methods tried was one that gave very satisfactory results, and which, both in regard to expense and labor, is a great improvement upon any heretofore tried. It consists

in using one part by weight of dry or undissolved potassium cyanide, with one part sulphuric acid and two parts of water. The generator is made of lead and is somewhat in the form of a common water-pail. After the tent is placed over the tree the necessary quantity of the dry cyanide is placed in the generator, the proper quantity of cold water added, and the generator placed under the tent near the trunk of the tree; the acid is then added to the materials in the generator, a barley sack thrown over the top of the latter, after which the operator withdraws and a quantity of earth is thrown upon the lower edge of the tent where it rests upon the ground to prevent the escape of the gas. After the expiration of fifteen minutes the tent is removed and placed upon another tree. I tested this method on several lemon trees and found that when the proper quantity of material had been used neither the foliage nor fruit on the trees were injured, while neither myself nor several other persons were able to find a living red scale upon the trees treated in this way.

The following table, based upon several of the tests referred to above, will aid in determining the proper quantity of each ingredient to use in treating orange and lemon trees:

Height of tree.	Diameter of tree.	Cyanide of potash.	Water.	Sulphuric acid.
Feet.	*Feet.*	*Ounces.*	*Fluid ozs.*	*Fluid ozs.*
10	8	$2\frac{1}{4}$	$4\frac{1}{2}$	$2\frac{1}{4}$
12	10	$4\frac{1}{2}$	9	$4\frac{1}{2}$
12	14	$8\frac{3}{4}$	$17\frac{1}{2}$	$8\frac{3}{4}$
14	10	$5\frac{1}{2}$	11	$5\frac{1}{2}$
14	12	$7\frac{1}{2}$	15	$7\frac{1}{2}$
16	14	12	24	12
18	14	15	30	15

It will be noticed that the proportions are 1 ounce by weight of the cyanide to 1 fluid ounce of the acid, and 2 fluid ounces of water; or in the proportion of cyanide one, acid one, water two. This being borne in mind, it will be very easy to ascertain how much acid and water to use when once the proper quantity of the cyanide required for treating any given tree has been ascertained.

In making the tests referred to above, I used commercial sulphuric acid and a medium grade of potassium cyanide, manufactured by Powers and Weightman, of Philadelphia, Pa. It is the same grade of cyanide as that which Mr. O. H. Leefeld purchased at the rate of 44 cents a pound, freightage included, as described in my report for 1888, page 125.

By comparing the table given above with the one given on page 125 of my report for the year 1888, it will be noticed that but little more than one-third the quantity of each ingredient is required for a tree of a given size by this new method, as compared with that required by the old one. In the third column of the table given in the previous report, each fluid ounce of the cyanide solution contains half an ounce by

weight of the dry cyanide. At this rate, by the old process, a tree 14 feet high by 12 feet in diameter required 21½ ounces by weight of the dry cyanide, whereas by the new process it will require only 7½ ounces. At the present prices of the cyanide and acid, the cost of the materials necessary to treat an orange tree of the size given above, by this new method will amount to about 26 cents, as compared with 76 cents, the price when the old process is used.

Not only is the new process much cheaper than the old, but it is also attended with much less labor. By using the cyanide dry we are saved the trouble of first dissolving it; the dry cyanide is also easier to transport and safer to handle than the solution is, and if the vessel containing it should be accidentally overturned on the ground, the dry cyanide will not be lost, as it certainly would if dissolved. By thus using the cyanide dry it is not necessary to first pass the gas through sulphuric acid in order to render it harmless to the trees, thereby saving a great deal of labor, and admitting of the use of a much simpler and less expensive generator. By placing the latter beneath the tent there is less liability of the gas escaping while being generated and introduced into the tent from without, thereby also insuring the operator greater immunity from inhaling the gas. I also found that by thus placing the generator under the tent the blower heretofore used for distributing the gas inside of the tent could be done away with, thereby still further reducing the original cost of a fumigating outfit, besides doing away with the labor necessary in operating the blower. The time during which it is necessary to confine the tree in the gas has also been reduced one-half as compared with that heretofore allowed for destroying the Fluted Scale (*Icerya purchasi* Maskell), thereby rendering it possible to treat twice the number of trees in a given time that could be treated in the same time by the old process. I found by experiment that about five minutes were consumed each time in generating the gas.

The treatment with hydrocyanic acid gas is the only method known to me whereby the scale-insects located upon the fruit can be destroyed by a single operation. My own experience, and that of every other person with whom I have conversed upon this subject and who has had any considerable experience in the matter, indicates that no liquid preparation at present known will by a single application prove fatal to more than 90 per cent. of the number of red scales located upon the fruit, and when it is remembered that the supervisors of many counties in this State have passed laws making it a misdemeanor to sell or expose for sale fruit infested with scale-insects, the value of the gas treatment to our fruit-growers is made apparent.

The following is an account of the experiments I made with hydrocyanic acid gas as referred to above. The trees operated on were all of them lemon trees containing fruit, and were in a comparatively healthy condition, although very thickly infested with the Red Scale. Before making these tests, I had the experimental tent painted black, and am

strongly of the opinion that when a tent of this color is used the foliage of the trees will be injured less when by inadvertence an overdose of the materials has been used than would be the case if a light-colored tent were to be used; the light rays, more than the rays of heat, serve to decompose the gas, and on this account any medium that will intercept the rays of light will, in a great measure, prevent the decomposing of the gas. In all cases where a blower was used for distributing the gas inside of the tent, the gas entered the blower direct from the generator and was forced into the lower part of the tent through a tin pipe, and the pipe which conducted the air and gas from the tent to the blower also entered the lower part of the tent and then turned upward, terminating near the top of the tent. By this means the gas and air in the upper part of the tent were drawn out and after passing through the blower again entered the lower part of the tent. This was for the purpose of more thoroughly circulating the gas inside of the tent; but, as will be seen by the later experiments this arrangement was found to be entirely unnecessary when the generator was placed under the tent. In nearly all of the later experiments too large a quantity of the materials was used, resulting in more or less injury to the tree or fruit, the injury being always the most severe on the topmost portion of the tree. The cyanide solution used in a few of these experiments consisted of 5 pounds of cyanide dissolved in 1 gallon of water, each fluid ounce of the solution containing an ounce by weight of the cyanide. The diluted sulphuric acid was composed of two fluid parts of the acid and three of water, and was allowed to become cold before being used.

(205) Took 10 fluid ounces of the cyanide solution and added in three minutes 12 fluid ounces of the diluted acid. 12.30 to 12.45 p. m., September 23, sun shining, light breeze. Scarcely turned the blower at all. Tree 12 feet high by 10 in diameter. When the tent was removed about half a dozen leaves on the new growth had perceptibly wilted. October 19, about three dozen leaves were dead; found eight live red scales, equally distributed on the leaves and fruit.

(206) Took 4 fluid ounces of the cyanide solution, and added in a minute and a half 2½ fluid ounces of pure sulphuric acid; turned the blower three minutes after adding the acid. 1.10 to 1.25 p. m., September 23, sun shining, light breeze. Tree 7 feet tall by 6 in diameter. When the tent was removed several of the leaves had wilted. October 19, about three dozen leaves and a large portion of the twigs on which they grew were dead; found only one live red scale, which was located upon a leaf.

(207) Took 6 ounces by weight of the dry cyanide and added in four minutes 12 fluid ounces pure sulphuric acid; turned the blower five minutes. 3.10 to 3.30 p. m., September 23, sun shining, light breeze. Tree 10 feet tall by 7 in diameter. October 19, leaves and fruit uninjured; found four live red scales, all of them located upon the leaves.

(208) Took 7 ounces dry cyanide and added in four minutes 16 fluid

ounces of the diluted acid; turned the blower five minutes. 3.55 to 4.15 p. m., September 23, sun shining, light breeze. Tree 9 feet tall by 8 in diameter. Two small pieces of cyanide remained in the generator unacted upon when the tent was removed from the tree. October 19, five dozen leaves and many of the young lemons were either dead or were more or less injured; found no live red scales.

(209) Took 7 ounces dry cyanide, set generator under the tent and added at once 14 fluid ounces pure sulphuric acid, placing a board over, but slightly above, the generator. 4.40 to 5 p. m., September 23, sun shining, light breeze. Tree 9 feet high by the same in diameter. October 19, no leaves or fruit were injured; found four live red scales, located mostly on the leaves.

(210) Took 2 ounces dry cyanide and 2¼ fluid ounces of water, added in a few seconds 2¼ ounces pure sulphuric acid. Turned the blower five minutes. 1 to 1.20 p. m., September 25, sun shining, light wind. Tree 8 feet high by 5 in diameter. October 19, about one-fourteenth of the leaves were killed; found no live red scales.

(211) Took 4 ounces dry cyanide and 4½ fluid ounces of water, added in a few seconds 4½ fluid ounces of pure sulphuric acid. 4.10 to 4.30 p. m., September 25, sun shining, light breeze. Turned the blower five minutes. Tree ten feet high by 9 in diameter. October 19, leaves and fruit uninjured; found no live red scales.

(212) Took 5 ounces dry cyanide and 10 ounces of water, added in a few seconds 5 ounces of pure sulphuric acid. Turned the blower five minutes. 5.10 to 5.30 p. m., September 25, sun shining, light breeze. Tree 11 feet high by 9 in diameter. October 19, leaves and fruit uninjured; found no live red scales.

(213) Took 7 ounces dry cyanide and 14 ounces water, added at once 7½ fluid ounces pure sulphuric acid. Turned the blower five minutes. 9.30 to 9.50 a. m., September 26, sun shining, light breeze. Tree 12 feet high by 10 in diameter. A piece of loose cotton batting a quarter of an inch in thickness was placed over the opening in the generator, through which the gas passed on its way from the generator to the tent. October 19, one-eighteenth of the leaves were killed and several of the green lemons were injured; found no live red scales.

(214) Took 5½ ounces dry cyanide and 22 fluid ounces of water, added at once 5¾ fluid ounces of sulphuric acid. Turned the blower five minutes. 10.30 to 10.50 a. m., September 26, sun shining, light breeze. Tree 10 feet high by 9 in diameter. Placed some cotton batting over the opening in the generator as described in the preceding experiment. October 19, one-eighth of the leaves were killed and several of the green lemons were injured; found no live red scales. (Two cats were confined in a barley-sack and placed on the ground beneath the tent before the latter was charged with the gas, and when the tent was removed from the tree both of them were dead.)

(215) Took 5 ounces dry cyanide and 10 ounces of water, added at

once 5¼ fluid ounces of sulphuric acid. Turned the blower five minutes. 11.25 to 11.40 a. m., September 26, sun shining, light breeze. Tree 10 feet high by 9 in diameter. Placed a piece of cotton batting over the opening in the generator as before. October 19, one-fifth of the leaves were killed; found no live red scales. Before being operated on this tree was in a very unhealthy condition.

(216) Took 3½ ounces dry cyanide and 8 ounces of water, added at once 4 ounces of pure sulphuric acid. Turned the blower five minutes. 1.50 to 2.05 p. m., September 26, sun shining, light breeze. Tree 11 feet high by 8 in diameter. Placed cotton batting over the opening in the generator as before. October 19, about eight dozen leaves were killed; found three live red scales.

(217) Took 5 ounces dry cyanide and 10 ounces of water, placed the generator under the tent and added at once 5½ ounces pure sulphuric acid and placed a barley sack over the generator. 2.35 to 2.50 p. m., September 26, sun shining, light breeze. Tree 12 feet high by 10 in diameter. October 19, leaves and fruit uninjured; found no live red scales.

(218) Took 6 ounces dry cyanide and 12 ounces water, placed the generator under the tent and added at once 6½ ounces of pure sulphuric acid, after which a barley sack was placed over the generator. 3.25 to 3.40 p. m., September 26, sun shining, light breeze. Tree 12 feet high by 10 in diameter. October 19, a few leaves at the top of the tree were killed; found no living red scales.

(219) Took 7 ounces dry cyanide and 14 ounces of water, placed the generator under the tent and added at once 7½ ounces of pure sulphuric acid, after which a barley sack was placed over the generator. 4.10 to 4.30 p. m., September 26, sun shining, light breeze. Tree 11 feet high by the same in diameter. October 19, a few leaves at the very top of the tree were killed and some of the green lemons were injured; found no live red scales.

THE LARVÆ OF HYPODERMA BOVIS, DE GEER.

By COOPER CURTICE, *Veterinarian.*

In the course of investigations of the Bureau of Animal Industry made during December, 1889, and January, 1890, I have been collecting the larvæ of *Hypoderma bovis* from cattle. I found larvæ of the first stage* (1) in the œsophageal walls, (2) one specimen under the pleura near the eleventh rib, (3) in the subcutaneous tissue of the back, and (4) in subcutaneous tumors which opened by an orifice upon the external skin. Larvæ of the second and third stages have been discovered

*By *first stage* I mean the earliest stage found. They were from 10-15^{mm} long and 1.5^{mm} thick, and were similar to the first stage of *Hypoderma diana*, as figured by Brauer (Mon. d. Œstriden).—C. C.

only in tumors. Molts of the first stage were found in the tumors with the second and were the means of connecting the three stages. Larvæ of the first stage were more abundant in the earlier part of the collection; in the latter part but few could be found, and later stages were more abundant. Hinrichsen, 1888 (Archiv. f. wiss. u. prak. Thierheilkunde, Bd. XIV, p. 219), found the first stages of a larva he hesitatingly referred to *H. bovis* in the spinal canals of ten out of twenty-five head of cattle examined. The presence of these larvæ of the first stages in the œsophagus, back, subcutaneous tissue and tumors, suggests that the life history of a certain portion of the larvæ, if not all, has been overlooked. It is possible that the eggs or young larvæ are licked by the cattle from the backs; that the larvæ make their way into the œsophageal walls, and from thence, during the proper season, through the back in the neighborhood of the eleventh rib, to the skin.

Further observations of this parasite will be máde throughout the year in order to definitely establish the life history of the youngest stage, which hitherto seems to have been neglected. Illustrations of the various stages of the parasites and the injuries they produce will accompany the detailed report of the investigations which will appear in the publications of the Bureau of Animal Industry.

THE IMPORTED GIPSY MOTH.

(*Ocneria dispar L.*)

FIG. 36.—*Ocneria dispar*, female—natural size (after Ratzeburg).

This conspicuous insect, although not recorded in any of our check-lists of North American Lepidoptera, has undoubtedly been present in a restricted locality in Massachusetts for about twenty years. It was imported by Mr. L. Trouvelot in the course of his experiments with silk-worms recorded in the early volumes of the *American Naturalist*, and certain of the moths escaping, he announced the fact publicly, and we mentioned it in the second volume of the *American Entomologist*, p. 111 (1870), and in our second report on the insects of Missouri, p. 10. It is, indeed, a curious fact that during these twenty years the insect has not become a pest until last season, and still more curious

that the moth does not seem to have found its way into the collections and is not mentioned in the check-lists. Last summer, however, it attracted considerable attention, and specimens were sent from Medford to the agricultural experiment station at Amherst, where Mrs. C. H. Fernald, in the absence of her husband, recognized the species. Several newspaper articles were published during the season, notably those in *The New England Farmer*, for July 13, and *The Boston Transcript* of October 31 and November 14.

Professor Fernald on his return from Europe undertook a thorough investigation of the matter, and in a special bulletin of the experiment station of the Massachusetts Agricultural College, published by the assistance of the secretary of the Board of Agriculture, and received by us November 29, has published an eight-page account of the species, with illustrations of the larva and pupa taken from Ratzeburg, and both sexes of the moth drawn from nature. Professor Fernald gives popular descriptions of the different states, and as a remedy recommends spraying all trees in the infested region with Paris green (1 pound to 150 gallons of water) soon after the hatching of the eggs in the spring, for two or three years under competent direction, and predicts the entire destruction of the pest if this course is followed. In Europe it is generally held in check by its natural enemies, but occasionally it becomes very destructive. In 1817 the cork-oaks of southern France suffered severely, and in 1878 the plane trees of the public promenades in Lyons were nearly ruined. Last summer Professor Fernald saw the moth in immense numbers on the trees of the Zoölogical Garden in Berlin, where the caterpillar had done great injury, and the opinion was expressed to him by prominent entomologists in Europe that if the species should get a foothold in this country it would become a far greater pest than the Colorado Potato-beetle on account of its prolificness, and the great number of its food-plants. The European food-plants are, among others, Apple, Pear, Plum, Cherry, Quince, Apricot, Lime, Pomegranate, Linden, Elm, Birch, Beech, Oak, Poplar, Willow, Hornbeam, Ash, Hazel, Larch, Fir, Azalia, Myrtle, Rose, and Cabbage. It is found in nearly all parts of Europe, and in southern and western Asia, extending as far as to Japan.

FIG. 37.—*Ocneria dispar*, male—natural size (after Kirby).

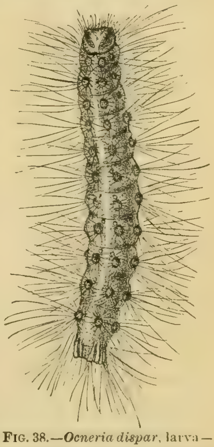

FIG. 38.—*Ocneria dispar*, larva—natural size (after Ratzeburg).

Prof. W. P. Brooks found it abundant at Sapporo in Japan in 1883, where it fed upon strawberry in addition to other plants. In Massachusetts it is reported as feeding upon the leaves of Apple, Cherry, Quince, Elm, Linden, Maple, Balm of Gilead, Birch, Oak, Willow, Wistaria, Norway Spruce, and Corn. Professor Fernald states that in this country it occurs only in Medford, Mass., where it occupies an area in the form of an ellipse about 1½ miles long by one-half mile wide. We have just learned, however, from Mr. Lewis E. Hood, of Somerville, that it was observed in that town last summer. The instance mentioned in INSECT LIFE, Vol. II, p. 86, of its occurrence at Winchester is still uncertain, as only partly grown larvæ were sent by our correspondent, Mrs. Holt.

FIG. 39.—*Ocneria dispar*, pupa—natural size (after Ratzeburg.)

Regarding its natural enemies, Professor Fernald states that none have been noticed in this country, but that eleven species of *Ichneumonidæ* and seven species of *Tachina* flies have been noticed in Europe. This statement is evidently taken from Ratzeburg, who mentions this precise number of eleven Hymenopterous parasites (not all Ichneumonidæ, by the way). By means, however, of a manuscript catalogue of the relations of parasitic Hymenoptera, which Mr. Howard has in preparation, we are able to more than double this list, and as a matter of general interest we publish the following:

1. *Pimpla flavicans* Rtz., Rtz. W. S.
2. *Pimpla instigator* Grav., G. et L. 409, Rtz. W. S.
3. *Pezomachus hortensis* Gr., (hyper) Brischke A. W. T. 128.
4. *Limneria difformis* Gr., Kirch., 94.
5. *Hemiteles fulvipes* Gr., Kirch. 66, Brdg. Ent. XVI, 106, Brischke, A. W. T., Rtz. W. S.
6. *Campoplex conicus* Rtz., Kirch 90, Rtz. W. S.
7. *Campoplex difformis* Gr., Rtz. W. S. = *Limneria.*
8. *Mesochorus pectoralis* Rtz., Rtz. W. S.
9. *Mesochorus gracilis,* Brischke A. W. T. 128.
10. *Mesochorus splendidulus* Gr., Brischke A. W. T. 128.
11. *Apanteles glomeratus* L., G. et L., 413.
12. *Apanteles fulvipes* Hal., Brischke A. W. T. 128.
13. *Apanteles melanoscelus* Rtz., Kirch. 121, Rtz. W. S. = *Apanteles difficilis* Nees.
14. *Apanteles solitarius* Rtz., Kirch. 122, Rtz. W. S., Brischke A. W. T. 128.
15. *Microgaster calceatus* Hal., Marsh. M. B. B. 246.
16. *Microgaster (?) tenebrosus* Wesm., Brischke A. W. T. 128.
17. *Microgaster tibialis* Nees., Brischke A. W. T. 128.
18. *Microgaster (?) liparidis* Ratz., Ratz. W. S., Kirch, 121.

19. *Microgaster pubescens* Rtz., Kirch. 121, Rtz. W. S. = *calceatus* Hal.
20. *Eurytoma abrotani* Panz., Rtz. W. S., Kirch. 155, Brischke, A. W. T. 128.
21. *Pteromalus halidayanus* Rtz., (hyper) Brischke, A. W. T. 130.
22. *Pteromalus pini* Hartig, (hyper) Brischke, A. W. T. 128.
23. *Pteromalus bouchéanus* Rtz., (hyper) Brischke, A. W. T. 128, G. et L. 428.
24. *Eupelmus bifasciatus* Giraud, G. et L. 420. On eggs.

Among the twenty-four species above mentioned there will undoubtedly be a few synonyms, and from the known generic habits there are unquestionably a number of secondary parasites. Brischke has called special attention to the fact that Nos. 17, 21, 22, and 23 are hyper-parasites, and to these we may unquestionably add 13, and in all probability, 14, 15, and 16, as *Mesochorus* has often been reared from *Microgaster* cocoons, and as we are not familiar with any cases of primary parasitism in this genus. There is also some little doubt about the species of *Campoplex*, so that only fourteen undoubted primary parasites are left. The majority of these insects are not confined to *Ocneria dispar*, and some of them are well-known and widely-spread beneficial insects. The *Apanteles glomeratus*, for instance, is a well-known European parasite of the common Cabbage Worm, and occurs quite abundantly in this country. It is almost incredible that the caterpillar should have no American parasite, and we imagine that careful study will show that some of our American species of the *Microgasterinæ*, at least, will be found to infest it, while predatory insects, of course, are not so strictly confined as to the character of their prey.

In conclusion we may state that if Professor Fernald's recommendations are carried out at all strictly we have little fear of the spread of this pest, and agree with him that it can be entirely killed out with the expenditure of a little time and money.

SOME INSECT PESTS OF THE HOUSEHOLD.

By C. V. Riley.

[Continued from page 130.]

THE TRUE CLOTHES-MOTHS.*

"And he, as a rotten thing, consumeth, as a garment, that is moth-eaten."—Job, xiii, 28.

The true clothes-moths are the housekeepers' dreads, in parts of the country where the Buffalo-bug is not known, and they flourish, though with diminished prominence, through comparison with the Buffalo-moth, in all sections. They are cosmopolitan insects, having been carried in clothes to all parts of the world, and no one of them is indigenous in the United States, so far as we know. The greatest confusion existed

*Reprinted substantially from *Good Housekeeping*, April 27, 1889.

until within recent years as to the proper nomenclature of the species noted for their damage in this country, and as a striking example I may state that Dr. Packard, in his well-known *Guide to the Study of Insects*, under the head of "The Common Clothes-moth," describes the larva, case, and pupa of one species, the moth of a second, and gives it the name of a third. Some years ago I sent a number of specimens to Lord Walsingham of Merton Hall, England, a world-famous authority upon these small insects, and cleared up, with his assistance, the confusion then existing. About the same time Prof. C. H. Fernald, then of Orono, Me., now of Amherst, Mass., also performed the same task with Lord Walsingham's assistance.

From these investigations we learn that there are three distinct species of clothes-moths common in this country, all of which are of European origin. They are somewhat similar in the larva and pupa states and all lay minute pale yellowish ovoid eggs or nits on the stuffs which they attack and injure; but they differ somewhat in the moth

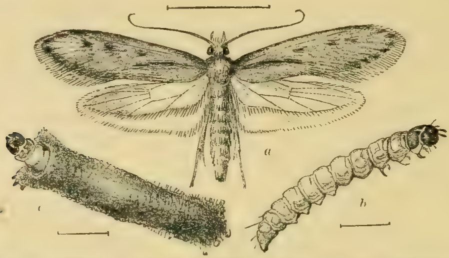

FIG. 40.—*Tinea pellionella*—enlarged—*a*, adult; *b*, larva; *c*, larva in case (after Riley).

or imago state. The statements of habits which are here given are for temperate regions; in more southern regions and in houses kept uninterruptedly warm by furnace or steam heat there is danger of continued injury during winter, and an increased number of generations, where ordinarily in more northern regions there is cessation of injury during the cold season.

The common case-making species is properly called *Tinea pellionella* Linn. The species which makes a gallery of the substance on which it is at work should be known as *Tinea tapetzella* Linn, while the third species, which does not make a case, but in transforming constructs a cocoon by webbing together bits of the substance upon which it feeds should be called *Tineola biselliella* Hummel.

Perhaps the commonest of these in more northern regions is the case-bearing species (*T. pellionella*), shown at Fig. 40. Its habits may thus briefly be stated: The small light-brown moths, distinguished, as shown at Fig. 40 *a*, by the darker spots at intervals on the wings, begin to appear in May and are occasionally seen flitting about as late as August. They pair and the female then searches for suitable places for the deposition

of her eggs, working her way into dark corners and deep into the folds of garments, apparently choosing by instinct the least conspicuous places. From these eggs hatch the white, soft-bodied larvæ (see Fig. 40*b*), each of which begins immediately to make a case for itself from the fragments of the cloth upon which it feeds. The case is in the shape of a hollow roll or cylinder and the interior is lined with silk (see Fig. 40*c*). As they grow they enlarge these cases by adding material to either end and by inserting gores down the sides which they slit open for the purpose. The larva reaches its full growth toward winter and then, crawling into some yet more protected spot, remains there torpid through the winter within its case, which is at this time thickened and fastened at either end with silk. I have known these larvæ in autumn to leave the carpet upon which they had fed, drag their heavy cases up a 15-foot wall and fasten them in the angle of the cornice of the ceiling. The transformation to pupa takes place within the case the following spring and the moths soon afterward issue. Such is the life round of the first species. It feeds in all woolen cloths and also in hair cloth, furs, and feathers. Curiously enough a little parasite sometimes enters the house and lays its eggs in the destructive larvæ. The accompanying drawing (Fig. 41) was made from specimens received from Michigan. It may be known as *Hyperacmus tineæ*.

FIG. 41.—*Hyperacmus tineæ*—enlarged (after Riley).

The next species—*Tineola biselliella*—makes no case, but when ready to transform constructs a cocoon mainly from fragments of the material upon which it has been feeding. It spins a certain amount of silk, however, wherever it goes. It is the most common species at Washington, and, so far as my experience goes, in the Southern States. It is generally fond of the same substances upon which the former feeds, and is quite as voracious. A curious instance was brought to my attention in 1884, in which a large stock of feather dusters was completely ruined by this species, while I have often had fine camel's-hair brushes ruined by it when they have been left lying loose in drawers. Its life round is much the same as that of the species just described, but it is commonly believed that

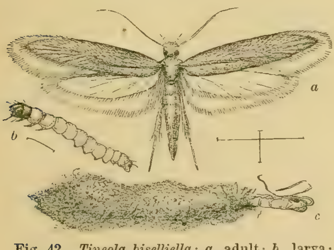

Fig. 42.—*Tineola biselliella*: *a*, adult; *b*, larva; *c*, cocoon and empty pupa-skin—enlarged (after Riley).

there is more than one generation annually in southern latitudes. The parent moth (Fig. 42*a*) is of a delicate straw-color and has no black spots. The larva is shown at Fig. 42*b* and the cocoon at Fig. 42*c*. The latter is often found with the empty pupa-skin protruding from its extremity.

The moth of *Tinea tapetzella*—the last species—is readily distinguished from the others by the fact that the front wings are black from the base to the middle, and white beyond. The white portion is often clouded with dark gray. The habits of this species are much the same as in the others except that the larva forms for itself a silken gallery mixed with fragments of cloth and thus destroys much more material than it needs for food. It remains hidden within some part of the gallery and retreats to another portion when alarmed. It transforms to pupa without other covering than the gallery affords. This is probably the species mentioned by Pliny and referred to in Holy Writ. The moth is shown at Fig. 43.

FIG. 43.—*Tinea tapetzella*—enlarged (after Riley).

And now as to the question of remedies: During the latter part of May or early in June a vigorous campaign should be entered upon. All carpets, clothes, cloth-covered furniture, furs, and rugs should be thoroughly shaken and aired, and, if possible, exposed to the sunlight as long as practicable. If the house is badly infested or if any particular article is supposed to be badly infested, a free use of benzine, in the manner mentioned in my last article, will be advisable. All floor cracks and dark closets should be sprayed with this substance. Too much pains can not be taken to destroy every moth and every egg and every newly-hatched larva, for immunity for the rest of the year depends largely—almost entirely—upon the thoroughness with which the work of extermination is carried on at this time. The benzine spray will kill the insect in every stage, and it is one of the few substances which will destroy the egg. I would, however, repeat the caution as to its inflammability. No light should be brought into a room in which it has been used until after a thorough airing and until the odor is almost dissipated.

The proper packing away of furs and winter clothing through the summer is a serious matter. A great deal of unnecessary expenditure in the way of cedar chests and cedar wardrobes and various compounds in the way of powders has been urged by writers on these pests. But experience fully proves that after a thorough treatment in May or June, garments may be safely put away for the rest of the season with no other protection than wrapping them closely in stout paper, to preclude infection through some belated female. My assistant, Mr. L. O. Howard, tells me of an excellent plan which he has adopted. He buys for a

small sum from his tailor a number of pasteboard boxes in which they deliver suits, and his wife carefully folds and packs away all clothing, gumming a strip of wrapping paper around the edge of the cover so as to leave no crack. These boxes will last for a life-time with careful use. Others use for the same purpose ordinary paper flour sacks or linen pillow-cases, which answer well. The success of these means depends entirely on the thoroughness of the preliminary work. Camphor, tobacco, napthaline, and other strong odorants are only partial repellants and without the precaution urged are of little avail.

Cloth-covered furniture which is in constant use will not be harmed, and the same may be said of cloth-lined carriages. Where such furniture is stored away or kept unused in a dark room or where the carriages are left in a dark coach-house through the summer, at least two sprayings with benzine, say once in June and once about August 1, will be advisable. Another plan which will act as a protection in such cases is to sponge the cloth linings and covers both sides where possible, with a dilute solution of corrosive sublimate in alcohol made just strong enough not to leave a white mark on a black feather.

IRRIGATION AND INJURIOUS INSECTS.*

The question of the proposed reclamation of the arid lands of the West by irrigation is of great importance from the entomological standpoint, mainly in view of its influence upon the destructive appearances of the Rocky Mountain Locust or Western Grasshopper, which at irregular intervals has greatly damaged the agriculture of certain of our Western States and Territories. The last important invasion of this pest occurred during the years 1875 and 1876, and the devastation which it occasioned at that time is so fresh in the minds of all as to require no elaboration of the importance of the subject. The reports of the U. S. Entomological Commission, an organization founded in March, 1877, and composed of Professors C. V. Riley, A. S. Packard, and Cyrus Thomas, consider the question of the influence of irrigation of a large extent of the arid territory upon the increase of this pest, and from the first report of this Commission, published during the year 1878, and the second report, published in 1880, can be drawn a complete summary of the writings on this subject and the views in full of the Com-

* Reply written by Mr. Howard during Prof. Riley's absence in Europe, in answer to a circular letter from the Assistant Secretary of Agriculture to the heads of certain of the scientific divisions of the Department, asking for the bearings of the proposed Government irrigation of western lands upon the problems comprehended by the work of their respective divisions, for the use of the Senate Committee on Irrigation, of which Senator Stewart is chairman.

mission. Copies of those reports would accompany this statement but they have been long out of print. They may be found, however, in the library of the Geological Survey.

One of the most important results arrived at is the conclusion that an extensive system of irrigation upon a scale of greater magnitude than any which can be undertaken by a pioneer population will be not only necessary to the carrying on of agricultural operations within the belt of territory mapped out as the permanent breeding grounds of the locust, but with the prime result that such an introduction of diversified agriculture into these regions will abolish the conditions necessary to a permanent reproduction of the species, and will consequently reduce the danger of the appearance of destructive migratory swarms to a minimum. The one fact that, according to the careful statistics gathered by the Commission, the loss from this pest during the years 1874 to 1877 amounted to upwards of two hundred million dollars, is a mighty argument for the expenditure of the sums which it is proposed to devote to the purpose which Senator Stewart's committee is now investigating. The words which the Commission have devoted to the discussion of this point are best quoted, and I give in the following pages extracts from the first and second reports above referred to.

It is evident, therefore, that the final and complete solution of the locust problem depends to a certain extent upon the possibility of modifying, to some degree at least, the aridity of the great plains of the Northwest, which undoubtedly form the native breeding grounds of these insects.

By most persons this will be considered equivalent to saying that the locust problem will never be solved. It would scarcely be proper for us here to enter into a discussion of the question of the possibility of modifying the condition of the dry area, but we can not refrain from placing upon record our protest against any such conclusion as this. That man, with a mind that can bring art, science, and mechanics to the perfection now visible on every hand, must be forever unable to convert the desert into fertile fields or to redeem the waste places of earth, we can not believe unless we are shown that the moisture which once supplied these areas has forever taken its departure from our globe.

To what extent these dry areas of the west can be supplied with water and rendered fertile must be determined by those who are proficient in this particular branch of science; but that large sections can be redeemed by proper efforts, if made on a scale of sufficient magnitude, we have no doubt.

By utilizing all the water that flows down from the mountains for the purposes of irrigation; by collecting in reservoirs the winter supply and distributing it in the growing season, a very large section of these plains might be brought under cultivation, and extensive forests grown where now the surface is naked and barren. Every field brought into cultivation, every grove planted, is just so far a step toward the ultimate solution of the locust problem; and the nearer these can be brought to their native home the more effectual will they be in rooting them out. If extensive efforts in this direction were made in British America, north of Montana, also in eastern Montana, western Dakota, and the regions around the Black Hills, it would not only be of immense benefit in supplying new agricultural fields for emigrants from the locust problem; it would also be a most effectual method of settling the Indian question in this region. Just what can be done in the way of redeeming these areas we can not say, but when their settlement depends upon it, and the wel-

fare of a much larger area south and west also depends upon it, certainly the question is worthy of consideration by our national authorities.

The day is not far distant when our National Government will be compelled to meet this important question and to test the ability of man to accomplish the work.

The progress of settlement westward must necessarily be slow when it, as is now beginning to be the case, impinges upon the sterile area; it can only push onward when the front line is backed by a dense population and farms studded with groves. It is possible that if there were no other impediments to overcome than this sterility, formidable as it is, the gradual filling up of the border area with an active population would modify the conditions sufficiently, at least, to allow the pushing into and redemption of a belt of considerable breadth. But when to this difficulty is added the devouring locust the hope of success is greatly diminished. * * *

In the permanent region, which embraces the Rocky Mountain plateau and the bordering plains from the middle of Colorado northward, the rain-fall is insufficient for agricultural purposes, and hence irrigation has to be resorted to; in the temporary region this is unnecessary. The plains and plateaus of the permanent region are to a large extent distinguished by the presence of *Artemisia*, Chenopodiaceous plants, and what is usually termed "bunch-grass;" in short by all the characteristics of a drier climate. One other peculiarity which has not been overlooked appears to mark roughly the southern boundary of the permanent home of the Rocky Mountain locust, and that is the isothermal curve or line of the 50° of mean annual temperature, which also corresponds very nearly with the isothermal curve or line of summer temperature of 70°. But this applies only to that portion of the region which extends upon the plains east of the mountains.

If any practical means of exterminating the locusts in this permanent region could be devised the whole locust problem could be solved, and nothing further would be necessary; but when we take into consideration the vast extent of this area, and the fact that a very large portion of it can not be brought under cultivation without a material change in the climatic conditions, there appears but little hope that such a means of actual extermination will ever be devised, however much we may hope to check the injurious increase of the pest by the means recommended in the concluding chapter of this report. Our discussion of the future prospects of this region in reference to agriculture may as well, therefore, be on this basis.

* * * A careful investigation of this subject for several years and repeated visits in person to this region have served to convince us that, with the advantages afforded the system of irrigation necessarily adopted, there is no reason why the agricultural area lying along the east flank of the range should suffer any more from these pests than portions of the temporary regions.

* * * * * * *

This agricultural belt, extending from Colorado into British America, is partly along the margin of and partly in the very heart of the permanent breeding grounds where the swarms that invade the temporary region originate. It follows, then, as a natural consequence, that just so far as the numbers are lessened by the operations in this section, just so far will the agriculturists of the temporary region be benefited, and, as we will hereafter see, like operations in the latter region will benefit those in the permanent region. We are fully aware of the fact that the part of this vast region which can be irrigated and cultivated is small in comparison with the whole area which forms the native home of the species; but, fortunately, in one respect this cultivated belt occupies, in part at least, the point of departure of the swarms which invade the temporary region. This fact, therefore, renders it more important that it be occupied by an agricultural population.

Although we have admitted that we are unable to present any plan of exterminating the locusts that holds out sufficient promise of success to justify the General Government in undertaking it, it does not necessarily follow that there is no plan of modifying the evil which the Government would be justified in undertaking. On

the contrary, if the views we have advanced be correct, they suggest a means by which the General Government might greatly aid in bringing about the desired result; and fortunately the result would be beneficial even should we be mistaken in the opinions advanced.

As will be seen by what has been stated, the great desideratum is to settle the cultivated belt alluded to as rapidly as possible with an agricultural population. Wherever valuable and permanent mines are discovered in the neighboring mountains, the arable areas in the vicinity will be taken up and cultivated to an extent at least sufficient to supply the demand for agricultural products, as in parts of Colorado. But there are large sections where no such influence will be brought to bear, and this is the case along that portion of the belt where the agricultural population is most needed for the purpose mentioned.

An examination of Map No. 1, in our first report, will show that a comparatively limited belt in central Montana, extending from the Big Horn Mountains northwest to the British line, a little west of Cypress Hill, forms the turning point of the locust movements. Without now repeating the data, which may be found in that report, we may summarize it by saying that from this region a large portion of the swarms come which visit Dakota, Minnesota, Nebraska, and Kansas; from this area also proceed a large portion of the swarms that move southwest into Idaho and Utah; this appears to be the point to which most of the returning swarms from the temporary region direct their flight.

That there are other areas in the permanent region which appear to be special breeding grounds, as points of departure, is certainly true, but none to such an extent as this, and none affecting an agricultural area bearing any comparison with the area affected by the locust swarms originating in this belt.

Even should it be shown by subsequent investigations that as a rule the swarms falling on the temporary regions come from intermediate points, as central and southern Dakota and northwestern Nebraska, the facts already ascertained warrant us in asserting that, as a very general rule, they originate in the belt mentioned.

It is evident, therefore, that if any method can be devised by which an agricultural (not pastoral) population can be thrown into this belt it will form one of the best possible means of modifying the evil. If they can be effectually distributed in this area the result will be of immense value to the agricultural interests of Dakota, Minnesota, Nebraska, Iowa, and Kansas, in fact of the entire temporary region. We do not pretend that it will wholly relieve this area from locust invasions, but it will very materially lessen their extent and injury.

In order to carry on agricultural operations to any great extent in this belt, an extensive system of irrigation will be absolutely necessary. It will have to be on a scale of greater magnitude than any that will be undertaken by a pioneer population. We doubt the propriety of the General Government undertaking such a work directly, if it is possible to accomplish it in any other way. This, we think, may possibly be done by giving the land for this purpose. We are fully aware of the opposition at present to the Government's donating any more of the public land, but the circumstances of this case bring it out of the general rule. If donating the entire body of public land in the belt described would suffice to settle it with an agricultural population, not only would the very purpose for which it is held be accomplished, but, if our views are correct, the result would be of immense benefit to the border States.

We therefore suggest the following as probably the most feasible plan of accomplishing the desired end: Let the United States donate a belt of 50 or 60 miles in width, running from the Black Hills west-northwest, so as to strike the Yellowstone River a short distance above the mouth of the Big Horn River; from thence north-northwest by way of Fort Shaw, or the mouth of Sun River, in the direction of Fort Hamilton, in British America—this to be granted on condition that the company to which said land is granted shall, within a given time, construct a railroad from the

Black Hills along the line designated to the international boundary; shall undertake and carry out to an extent to be designated a system of irrigation, and shall equip and keep in operation said road for a certain number of years.

Whether such grant will be sufficient inducement for any competent company to undertake the work specified is probably the chief difficulty in the way of successfully carrying out this plan. On this point we do not feel qualified to express an opinion. That such a road starting from the Black Hills, if once built, would soon be connected southward and eastward with other roads can not be doubted. That it would be the best possible means of bringing an agricultural population into this belt can not be doubted. It would also be an important factor in settling the troublesome Indian problem in this section of the West.

If the plan should be adopted it might be well to colonize, if possible, with Russian peasants who are accustomed to fighting locusts.

The advantage to be derived from this plan consists chiefly in the fact that it is possible to destroy the young to a very large extent by the use of the proper means. If this is done in the very heart of their breeding grounds it greatly lessens the numbers that will migrate. Not only does it prevent the number destroyed from migrating, but of each one killed, so to speak, an entire family brood of the next or migrating generation is destroyed. In other words, the destruction of thousands there would be as effectual as destroying millions of the migrating swarms. The means of destroying the young, as before stated, can be made more effectual in the sections where irrigation is carried on than where it is not.

As shown in our first report, the destruction of the young locusts bred in the temporary region from the invading hordes not only gives immediate relief, but also tends to postpone future invasions by so lessening the numbers in the returning swarms that a longer time is required for development. With an agricultural population in the area designated the work of destruction would then be carried on at each end of their migratory route.

Here we may also remark that the present idea of making that section of our country a peculiarly pastoral area, while doubtless profitable to the present and for two or three generations to come, will in the end entail hardships upon those to follow. It can no longer be doubted that while the destruction of forests was the chief agency, yet the pastoral habit of the people of western Asia and other oriental countries, once so fertile but now barren, was one important factor in producing the present dry and barren condition of those countries. No country in the interior of a continent, unless supplied with numerous lakes or numerous and permanent rivers, can remain permanently fertile and productive if given up largely to pasturage of sheep, goats, and cattle, without cultivation. The rapid destruction of mountain forests, and pasturing their slopes and bordering plains, will most certainly have a tendency to render that portion of our country more dry and barren.

Unless, therefore, our Government adopts some policy by which an agricultural population can be thrown into that area, the day will most assuredly come when it will be as barren and desolate as the plains of Arabia. The development of the locusts is but an incident of the change from a former condition of abundant moisture to the present dry one. But this branch of the subject we propose to omit at present.

It will be seen, therefore, by the foregoing that we think it is possible to modify to a very large extent the operations of the locusts so far as these relate to the area along the east flank of the mountains, and that the General Government may, without any very great expense, very greatly assist in the work.

* * * * * * *

This certainly shows a very moderate climate for this northern latitude. Wheat, oats, rye, and barley grow well, and Indian corn is also raised without difficulty and produces good crops. Such fruits as apples, plums, cherries, currants, raspberries, and gooseberries may be grown and matured here, the climate presenting no serious obstacle.

The amount of land that can be brought under cultivation depends wholly upon the amount of water that can be obtained for irrigation. If the plan for making reservoirs for preserving the winter supply should ever be adopted, the breadth of the agricultural belt would be very largely increased, and this would be doubly beneficial in assisting to destroy the locusts and tending to increase the moisture in the atmosphere by forming a larger evaporating surface. The growth of trees and shrubbery around these reservoirs would also be beneficial in the same direction.

But experience in the settling of these mountain regions and Western Territories shows that no such extensive works will, or in fact can be, undertaken by a pioneer agricultural population. Some efficient aid of some kind must be given if such a scheme is ever carried into effect, and if the land itself will do this, the Government will act wisely in giving it for this purpose.

*   *   *   *   *   *   *

As shown by our first report the region around Salt Lake is subject to repeated locust invasion from the north, apparently the resulting broods of the swarms that originate in that portion of Montana of which we have been speaking, and which, pouring over the mountain-pass at the head of Jefferson River, move down Snake River Valley.

If the scheme we have suggested should be carried out and should prove beneficial in reference to the eastern area, it would have, to some extent at least, a like effect as to this section. If it is possible to establish and maintain an agricultural population in the Upper Snake River Valley, this would have a strong tendency to modify the evil. But the present barren aspect of this region would seem to forbid any hopes of ever accomplishing this desired end. Still there appears to be one possible means of bringing this about, at least to a limited extent. The demand of trade will doubtless complete the railroad already started in that direction, which is one step towards the desired end, but something more is required in this case.

Snake River affords a large body of water which if properly utilized would irrigate a large breadth of land, and notwithstanding the barren appearance of the soil, it is really fertile when irrigated. It is possible, with a moderate expense, to throw dams across this stream at certain favorable spots, and by this means to spread the water over the adjoining plains. A work of this kind would, of course, have to be done by the General Government. The feasibility of this project could easily be ascertained by an officer of the Engineer Corps of the Army; and as this is on the line of the chief inter-montane thoroughfare, and also of the locust invasions of this region, the subject is certainly worthy of the attention of the Government.

As will be seen by what we have presented on this subject, the philosophy of our plan for modifying the evil is to place an agricultural population in the very home of the species, which from necessity would be compelled to wage a constant warfare against them.

By stirring the soil their nests would be disturbed; by fighting the young their numbers would be diminished; and as irrigation would be necessary, the effect of dry seasons on the crops would not be felt as in the temporary region. The possibility of inundating to a considerable extent their egg deposits by the winter supply of water would tend to diminish their numbers. The fact that their breeding-grounds are chiefly in the limited agricultural areas is also another argument in favor of the plan.

That large areas would be left where locusts breed and pour down on the nearest cultivated areas, as in western Colorado, is certainly true, but this does not lessen the value of the plan proposed, nor is it a reason why it should not be put into operation.

The effect of irrigation upon the Rocky Mountain Locust dwarfs into comparative insignificance anything which may be said concerning its influence on other destructive species, yet there are many forms which depend for their existence and multiplication upon a dry climate, and

which a thorough system of irrigation would render comparatively harmless.

This has been recognized by the prominent writers upon economic entomology, and I may quote the words of my chief, Professor Riley, as follows:

I have repeatedly laid stress in my writings on the importance of irrigation in combatting several of our worst insect enemies, and, aside from its benefits in this direction, every recurrence of a droughty year convinces me of its guarding against failure of crops from excessive drought. I am glad to know that many farmers, and especially small-fruit growers in the vicinity of New York, are preparing in one way or another for irrigation whenever it becomes necessary, and I was pleased to hear Dr. Hexamer, at the late meeting of the American Pomological Society, urge a general system of irrigation as the most profitable investment the cultivator can make in a climate subject to such periods of drought as ours is known to be.

Perhaps the most striking example among this class of insects is the Chinch Bug—a species which damages certain cereal crops to the extent of upwards of five millions of dollars in years of abundance. This insect is directly influenced by moisture and seldom occurs in numbers in the more eastern States except after two or more successive seasons of drought. After a year of excessive multiplication these insects will often be found to have hibernated in immense numbers, and it is a well-known fact that heavy rain-falls the succeeding spring will destroy them almost completely. This being the case an artificial system of irrigation will enable the agriculturalists to hold this insect completely in check, and such a system as it is proposed to introduce in the West will render the grain-growers of the reclaimed regions independent of the damage which may be done by this insect and will enable them to compete on most advantageous terms with the grain-growers of the more eastern localities, whose crops are occasionally subject to almost total loss by this insect enemy. I may again quote from Professor Riley:

Irrigation where it can be applied—and it can be in much of the territory in the vicinity of the Rocky Mountains, where the insect commits sad havoc, as with a little effort in many regions in the heart of the Mississippi Valley—is the only real available practicable remedy after the bugs have commenced multiplying in the spring. I wish to lay particular stress upon this matter of irrigation, believing, as I do, that it is an effectual remedy against this pest, and that by overflowing a grain field for a couple of days, or by saturating the ground after as many more in the month of May, we may effectually prevent its subsequent injuries.—(Seventh Report Insects of Missouri.)

We may mention also the case of the Grape-vine Phylloxera and may again quote from Professor Riley:

Submersion, where practicable, and where it is total and sufficiently prolonged, is a perfect remedy. This is what even the closest student might expect, as he finds that excessive moisture is very disastrous to the lice. M. Louis Faucon, of Graveson (Bouches-du-Rhône), France, has abundantly proved its efficacy, and has by means of it totally annihilated the insect in his vineyard, which was suffering from it four years ago. From his experience we may draw the following conclusions:

(1) The best season to submerge is in autumn (September and October), when the lice are yet active and the vines have ceased growing. Submergence for 25 to 30 days at this season will generally rout the lice.

(2) A submergence of 40 to 50 days in winter is required, and even where the water is allowed to remain during the whole season the vineyard does not suffer. I should consider this very doubtful.

(3) A vineyard should never be inundated for a longer period than two days in summer or during growth; and, though these brief inundations at that season affect only the few lice near the surface and are by no means essential, they are nevertheless important auxiliaries to the more thorough fall or winter submersion, as they destroy the few lice which are always invading a vineyard in infested districts. These summer inundations will be necessary only after the winged insects begin to appear, and three or four, each lasting less than two days, made between the middle of July and the fall of the leaf, will effect the end desired.

(4) An embankment should be made around the vineyard in order that the water may evaporate and permeate the earth, but not run off and carry away any nutritive properties of the soil.

The varied success which has attended the different attempts to rout the enemy by inundation is owing to the lack of thoroughness in many of them. The ground must be thoroughly soaked for a sufficient length of time. Temporary irrigation does not accomplish the end, for the reason that it does not reach all the lice, and does not break up the numerous air bubbles which form in the soil and prevent the drowning of many of the insects. (Sixth Report Insects of Missouri.)

Too much in fact can not be said of the advantages of a system of irrigation in fighting many insect pests.

A good instance occurred in our experience in the spring of 1879, when the Army Worm appeared in great force upon a large grass plantation near Portsmouth, Va. The plantation was divided into sections by irrigating ditches, and it was only necessary to turn on the water to isolate a badly infested section and to devote it to rolling, fire, or some other means of destruction, preventing ready spread to other sections. In the same way rice planters have a ready means of fighting insect pests at hand.

Other insects might be particularized, but the general statement that from the stand-point of the economic entomologist irrigation in general is a great help in fighting insect pests, and from the marked illustration of the great good accomplished by the reclamation of the arid regions in connection with the damage done by the Rocky Mountain locust it will probably be considered that further elaboration is unnecessary.

Respectfully submitted, May 13, 1889.

NOTE ON THE OVIPOSITION AND EMBRYONIC DEVELOPMENT OF XIPHIDIUM ENSIFERUM, Scud.

By William M. Wheeler, *Milwaukee, Wis.*

Though the Orthoptera have received more attention from students of insect embryology than any other natural order of Hexapoda, there still remain several families which, owing to the difficulty of procuring sufficient material, have not been studied. We possess monographs, more or less complete, on members of the Gryllid, Acridiid, and Blat-

tid groups, but besides a few observations on an European *Mantis* we have no observations on members of the families *Locustidæ*, *Mantidæ*, and *Phasmidæ*. The differences in the details of embryonic development observed in the Orthoptera hitherto investigated are so great that all students of the subject must look forward with considerable interest to any results accruing from the study of representatives of these four families. In my search for insects' eggs of a convenient size, procurable in abundance, and representing families heretofore unstudied, I happened on one of the *Locustidæ*, the eggs of which meet the requirements. The species to which I allude is *Xiphidium ensiferum*, Scud., a very common insect about the meadows and marshlands of Wisconsin and the adjacent states.

Unlike other species of the family whose oviposition has been described, *Xiphidium ensiferum* does not oviposit on or in twigs, but between the scales of a Cecidomyid gall, very common on the willows which grow in the damp situations haunted by the Locustid. Mr. L. O. Howard, who kindly examined a specimen of the scaly turnip-shaped gall for me, pronounces it to be very probably produced by *Cecidomyia salicis-gnaphaloides*, Walsh. On September 8 I observed a female in the act of oviposition. She was perched with her head turned toward the apex of the gall, which contained besides the large white Cecidomyid larva in the center of its base, a number of the smaller orange-red larvæ of an inquiline Cecidomyid between the scale-like leaves. Slowly and sedately she thrust her sword-shaped ovipositor down between the leaves and, after depositing an egg, as slowly withdrew the organ in order to recommence the same operation after taking a few steps to one side of where she had been at work. She soon observed me and slipped away without completing her task.

The subopaque, cream-colored egg is elongate oval, 4 to 4.5^{mm} long and 1^{mm} broad through its middle. One of the poles is somewhat more attenuate than the other and there is a faint curvature in the polar axis which causes one side of the egg to be somewhat more convex than the other. The yolk, very similar in constitution to that of other Orthoptera, is pale yellow. It is inclosed by a delicate vitelline membrane and a thicker, opaque and somewhat leathery chorion which suddenly becomes transparent when immersed in alcohol. The eggs are deposited with their long axes parallel to the long axis of the gall and their attenuate poles upward. They are completely concealed by the leaves, the edges of which close over and very efficiently protect them. The number of eggs found in a gall varies considerably. Sometimes but two or three will be found, more frequently from fifty to one hundred; in one small gall I counted one hundred and seventy and I have opened a few galls which contained more. From these facts I conclude that one female frequently deposits her quantum of eggs in several galls, possibly having some means of selecting the best cradles for her offspring and perhaps trying several till she finds one perfectly

adapted to her purposes. Frequently as many as ten eggs will be found under a single scale. When this is the case, the eggs adhere to one another somewhat and are often irregularly placed, as if two or three insects had in succession oviposited in the same place.

Whereas the *Blattidæ* show the greatest fixity in habits of oviposition of any of the Orthopteran families, the *Locustidæ* exhibit the greatest variety. Some species like the American *Anabrus simplex* and the European *Locustæ* oviposit in the ground like the *Acridiidæ.* Others, like many species of *Xiphidium* and *Orchelimum*, oviposit in the pith of easily penetrated twigs. According to Professor Riley *Phaneroptera curvicauda* lays its eggs "singly in the edges of leaves, between the upper and lower cuticles." Other species, approaching *Xiphidium ensiferum* like *Conocephalus ensiger*, lay their eggs between the root-leaves and stems of various plants. The European *Meconema varium*, according to Taschenberg, oviposits under bark scales and occasionally in the galls of the Hymenopteron *Teras terminalis.* Still other forms to which our common Katydid (*Microcentrum retinervis*) belongs, lay their flattened, dark colored eggs in regular rows on twigs, after previously roughening the surface of the bark with their jaws.

The structure of the ovipostor in *Xiphidium ensiferum* would seem to indicate that, like other members of the genus, this species has been in the habit of puncturing the tissues of plants till within comparatively recent times, when it found oviposition in the galls more advantageous. So recent may be the acquisition of this habit that more extended investigation may perhaps show a tendency in some females to puncture twigs, or oviposit, like *Conocephalus*, between the root-leaves and stems of plants.

The Orthoptera present many interesting questions in connection with their habits of oviposition. Most of the species, excepting the aberrant *Phasmidæ*, oviposit in clusters, the eggs of which are arranged in more or less regular rows. This habit is most strenuously adhered to by the *Blattidæ*, though many species of *Acridiidæ*, *Gryllidæ*, *Locustidæ*, and *Mantidæ* are almost equally careful to deposit their eggs in symmetrical series.

During oviposition the two ovaries discharge their eggs alternately in rhythmical sequence, the insect moving a short distance directly forward after the extrusion of each egg or pair of eggs. For what purpose this habit should have been preserved with such tenacity through the long ages during which the Orthoptera have continued to people our earth I am unable to conjecture, unless it be supposed that the primitive species oviposited in portable capsules like those still made by the *Blattidæ.* The method of arranging eggs in two even and alternating series practiced by members of this family is of advantage to the insects, in that it renders the package more compact and more easily carried, just as a box may be made to contain a given number of cigars or similarly shaped objects more easily when they are packed in regular

rows than when they are thrown in promiscuously. The *Mantidæ*, which deposit their eggs in cocoons that are no longer carried, may be supposed to represent an intermediate stage as far as the habits of oviposition are concerned between the *Blattidæ* and those numerous forms which either deposit their eggs in exposed situations like *Microcentrum*, or bury them in the earth or the tissues of plants like the *Acridiidæ* and *Gryllidæ*.

The eggs of *Xiphidium ensiferum* begin to develop immediately after their deposition. During the warm days that intervene before the cold of autumn sets in the embryo is formed on the middle of the flat side of the yolk. The head of the embryo points downward towards the insertion of the leaves between which it is placed; consequently the pointed and upward directed pole is the caudal end. The young embryo remains dormant during the winter but continues its development during the warm days of spring. The first larvæ were seen to emerge from the galls on the 17th of May.

I will not here enter into the details of development, many of which I have not yet observed to my own satisfaction. Suffice it to say that the Locustid's ontogeny is strikingly like that of the Gryllid, *Œcanthus niveus* as described by Dr. Howard Ayers. The embryo, as noted above, is developed on the flat ventral face of the egg with its head directed downward. During its growth it gradually moves down the yolk till its head reaches the pole, then it turns and passes up the convex (formerly dorsal) surface of the yolk till its head reaches the pointed (formerly caudal) pole; the body of the embryo meanwhile increases in size and envelops the entire yolk by a very interesting process, the details of which I have not, as yet, been able clearly to elucidate. Considering the position in which the egg is deposited, *i. e.*, with its cephalic pole directed downwards, a revolution like the one described is necessary to bring the embryo's head to the opposite pole, so that in hatching the larva may have no difficulty in crawling out between the scales of the gall.

THE SIX-SPOTTED MITE OF THE ORANGE.

(*Tetranychus* 6-*maculatus*, n. sp.)

By C. V. Riley.

This mite has done much damage to the orange in Florida since 1886, and we have prepared a preliminary article for the Annual Report of this Department for 1889. As it is deemed wise to exclude purely descriptive matter from the Annual, we give here the diagnosis of the species under the the name of *Tetranychus* 6-*maculatus* on account of the quite constant markings of its back. In color it is very similar to *T. rosearum* Boisd., *T. tiliarum* Mull. and *T. vitis* Boisd.

Tetranychus 6-*maculatus* n. sp.—Length of the full-grown specimens 0. 3mm. General color, pale greenish-yellow, marked on the abdomen with six or less small dusky spots. General shape oval, somewhat broadest in front of the eyes; laterally slightly constricted just opposite the eyes and at about the middle of the body, at which latter constriction the body is divided by a more or less distinct suture into two parts. There is often, also a distinct, though small tail-like projection at the end of the body. Anterior projection of cephalothorax rather short, somewhat conical, its apex rounded. Terminal joint of legs longest. Eyes, two each side, the anterior one of each pair being blood-red, this pigment extending some distance into the body, giving the appearance of two red eyes on each side; the posterior eyes are colorless and transparent. The spots of the abdomen are arranged in two subdorsal rows, of three spots to each row; they are rounded and quite constant, especially in the smaller and more numerous specimens, though somewhat variable in the larger or full-grown mites.

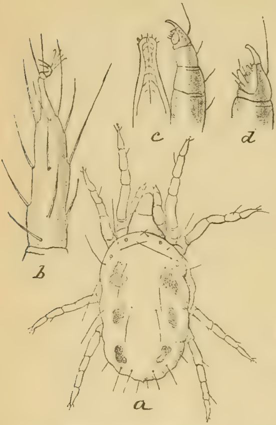

FIG. 44—*Tetranychus* 6-*maculatus*: *a*, rfom above—enlarged; *b*, tarsus; *c*, rostrum and palpus—still more enlarged; *d*, tip of palpus—still more enlarged (original).

In the mature specimens the anterior spots, which are arranged close to the dividing suture, are often composed of a collection of eight to twelve, larger or smaller, more or less circular, quite deep black spots, while in others all the spots are single, and with one or the other of the median pair wanting. In the smallest specimens these spots are either wanting or only the anterior or posterior pairs are present, the last pair in this case being generally largest and very distinct. The distribution of the hairs of the body is as follows: Two short, slender hairs medially at anterior margin, directed forward, crossing each other near their tips; each side of these, also close to the margin, at about equal distances from each other and the lateral margin is a pair of transparent, circular pores, resembling those which usually give rise to a bristle. In front of the eyes and removed slightly toward the middle is, on each side, a row of rather long and stout bristles, the anterior pair being directed outward and slightly toward the head, and projecting beyond the lateral margin; the median pair are directed forward and cross each other near their tips. The third pair are longest, situated a little in front of the eyes and directed backward. Besides these stout bristles there is another smaller and slender hair not far from the lateral margin behind the eyes, and another at the margin in front of the eyes. The abdomen is provided on each side with a subdorsal row of three very long bristles, a more slender lateral row, four long dorsal bristles surrounding the end, and four ventral terminal bristles, of which the median pair is smallest.

The eggs are 0.11mm in diameter, globular, either colorless and transparent or very pale greenish-yellow, and are loosely attached to the web.

HARPIPHORUS MACULATUS Norton.

By W. Hague Harrington, *Ottawa, Canada.*

The spotted saw-fly, whose larvæ feed upon the strawberry plant, is widely distributed, and probably well known to all collectors of Hymenoptera, as well as to growers of the delicious fruit which suffers from its ravages. There are, however, one or two points in connection with the species to which attention may be called. Last winter I discussed with Mr. Fletcher the fact that a large proportion of the specimens, which apparently belong to this species, would by the venation of the wings be placed in the genus *Monostegia*, instead of in *Harpiphorus*, and that they agreed closely with the description of *M. obscurata* Cresson.

During the past summer I collected as many specimens of this saw-fly as was possible, in order to further study the species, and to see if there existed sufficient reasons for separating these saw-flies into two species, or on the other hand for including with *H. maculatus* a few specimens which I had previously considered to represent *M. ignota* Norton.

The question has now been made additionally interesting to me by the publication in the November, 1889, number of Insect Life (pp. 137–140) of Mr. F. W. Malley's observations on *M. ignota* as a strawberry pest. The author, after mentioning the similar maculation of the abdomen, states that—

> The most certain method of distinguishing the species is to note the number of submarginal cells in the forewings, *M. ignota* having four, and *H. maculatus* only three.

I found that saw-flies were apparently very scarce last season, but the Strawberry Saw-fly was one of the few species that were moderately abundant. My captures were as follows:

Specimens having three submarginal cells:

Date.	Males.	Females.
May 9	1	1
10	....	1
12	1	....
13	1	....
24	3	3
27	....	1
June 2	....	3
26	....	1
Total	6	10

Specimens having four submarginal cells:

Date.	Males.	Females.
May 5	1	....
9	1	9
11	....	2
12	1	7
24	1	3
June 2	......	1
Total	4	22

This shows the two forms to occur during the same period and in comparatively the same abundance, and the habits of the adults were apparently in all respects similar. With those previously in my collection I have now before me 80 specimens, which appear to belong undoubt-

edly to the same species. Of these, 16 males and 24 females have *three* submarginals, and 8 males and 29 females have *four*. A connecting link between the two equal groups is formed by the remaining three specimens, which are females, and in each of which the left wing has *four* and the right wing *three* submarginals. Rudiments of the absent—or additional—cross-nervure may also be detected in a few of the other specimens.

As might be expected in a series of this length, there is a certain degree of variation in size, coloring, shape of antennæ, etc., but none apparently to warrant a separation into two species, or even varieties. I have, however, two males and one female, collected May 27, which have the abdomen perfectly immaculate, the legs paler and the antennæ shorter, and which appear to be distinct, and to belong to *Monostegia*. The antennæ in these specimens more resemble those of *Monophadnus*, having the second joint as long as the third and fourth united, and the apex blunt; whereas the antennæ in *H. maculatus* (especially in the male) are longer and more tapering, and have the third, fourth, and fifth joints more or less subequal.

Mr. Malley in his excellent plate figures the antennæ of his strawberry pest as of the Monostegia form, and also indicates differences in the larvæ, and possibly the species bred by him may really be a Monostegia and distinct from the specimens with four submarginals which I have taken and consider to be *H. maculatus*. The ornamentation of the abdomen, however, seems so characteristic that one would hardly expect to find insects thus marked feeding upon the same plant and yet belonging to different genera.

ADULTS OF THE AMERICAN CIMBEX INJURING THE WILLOW AND COTTONWOOD IN NEBRASKA.

By F. M. WEBSTER, *Lafayette, Ind.*

Under date of June 11, 1889, Hon. R. M. Pritchard, an old-time friend of the writer in Illinois, but now residing near Pender, Thurston County, Nebr., sent me specimens of both sexes of this species, accompanied by two letters, reading substantially as follows:

A few days since I was out in my grove of ash, willow, cottonwood, and box-elder, and was not a little startled by finding myself surrounded by what I first thought by their buzzing noise to be great numbers of the large, black hornets; but as the insects were not inclined to attack me, like the hornets of my boyhood days, I began to examine them and watch their movements. There were thousands of them, apparently in the act of mating, but for the most part flying high in the tops of the largest trees, being divided into groups which in their movements seemed to alternately approach and retreat from a central point among the tree-tops, making a noise like a lot of hornets, but moving much slower and more clumsily than hornets. I found a small number settled on the leaves and limbs of the ash and willows, where they seemed to be feeding on the sap. To-day I have been watching them more carefully,

and find that they cut a rough gash almost completely around the limb, seeming to kill the outer bark as far as they cut. This work is done with the jaws. They seem very lively during the middle of the day, and at that time are mostly on the wing, but as the air grows cooler they fasten to the twigs and begin to eat, seemingly being very clumsy and stupid, starting up quickly when approached, but not flying unless forced to do so, and then only a distance of a few feet, often falling to the ground.

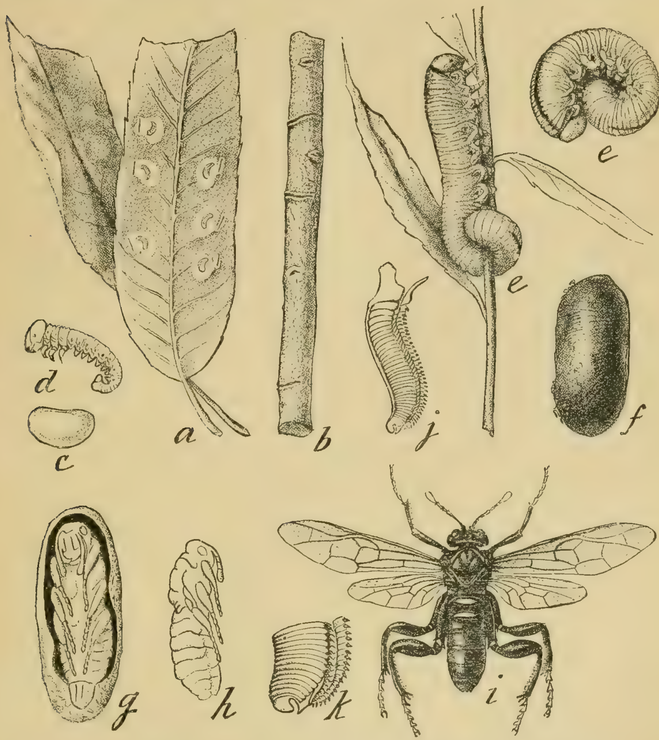

FIG. 45.—*Cimbex americana:* *a*, willow leaves showing egg-blisters from above and below; *b*, twig showing girdlings; *c*, egg; *d*, newly-hatched larva; *e*, *e*, full-grown larvæ; *f*, cocoon; *g*, cocoon cut open, with pupa; *h*, pupa, side view; *i*, female fly; *j*, her saw detached, side view; *k*, tip of saw—*c*, *d*, *j*, *k*, enlarged, the rest natural size. (After Riley.)

To-day I captured a male and female in the act of pairing, and send them to you for the purpose of learning what they are. I first thought of sending them to Mr. Bruner, an entomologist of high standing residing at West Point, in this State, but decided to send to you on account of "auld lang syne." As you know I have been planting trees all my life, or at least during the last fifty years of it, and I never saw such an insect before. I fear they will damage my grove, but perhaps not. Time will tell.

To my inquiry regarding the varieties of trees attacked, Mr. Pritchard kindly replied under date of July 6:

In only a very few instances do I find that the saw-flies attacked other trees besides the willows. On three or four tender cottonwoods I find they worked as if by mistake. The willows seem to recover and the gash cut by the insects heals over, but the cottonwood breaks off.

The only instance where this cutting habit of the adult saw-flies had been observed, so far as I can learn, is recorded in the Report of the Commissioner of Agriculture for 1884, pp. 334–6, Plate V, Fig. 1. In this case the depredation occurred on the grounds of Admiral Ammen, in the vicinity of Washington, D. C., only the willows suffering, but so great was the injury that the trees were described as looking as if a fire had run over them, or as if they had suffered from a severe frost.

The twigs of willow accompanying Mr. Pritchard's last communication resembled in every respect those figured in the report above referred to, although it would appear that in his case the injury resulting from the attack of the saw-flies was much less than in the case of Admiral Ammen.*

This cutting of the bark of the trees could have had nothing to do with the oviposition of the insect, as the eggs are deposited in slits cut in the leaves by the females. It seems quite possible that they gnaw the bark for the purpose of feeding upon the sap, as intimated by Mr. Pritchard, yet this does not appear to be fully proven. In other words, it would as yet be too much to say that in cutting the incisions the insect has no object in view other than that of obtaining food.

OBSERVATIONS ON MONOMORIUM PHARAONIS LATR.†

By M. A. BELLEVOYE, *Reims.*

Almost all the old habitations of Reims are infested with a little reddish ant, the *Monomorium pharaonis* Latr. These little insects visit without ceremony our tables; they haunt the side-boards and cupboards which contain eatables; the sugar-box, preserves, and meats are attacked by these small guests which do not ask leave to settle in your house. Their havoc, indeed, does not appear very important, notwithstanding their great numbers; but it is always disagreeable to find animate beings in one's eatables. It is, therefore, necessary to take vigorous measures in this regard; to kill them or use phenic or insecticide powders which drive them away from the places where they abound. The majority of people know only the neuters of this species.

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* We have since shown, INSECT LIFE, Vol I, p. 8, that the larger share of the damage at Admiral Ammen's was done by *Phyllœcus integer* and not by the Cimbex.

† Translated and condensed from Annales de la Société Entomologique de France, sixth series, Vol. VIII, 1888, fourth trimestre, Bulletin, pp. clxxvii–clxxxi.

I have just said that the ravages of these ants seem to me very unimportant, and I will show afterwards in what they consist. However, I have read in various authors, among others in the encyclopedia compiled by Dr. Chenu, this note:

The domestic ant of Schenk, a very small species which has of late made great devastation in England, in the houses of parts of London and Brighton, where it has settled and lays waste everything within its reach.

In the remarkable work of Mr. Edm. André, the Species of Hymenoptera of Europe and Algeria, the *Monomorium pharaonis* is indicated as being a native of Algeria, Palestine, and the tropical and sub-tropical regions of the whole world. The following is there given, together with a description of the three kinds or sexes.

This cosmopolitan species, which lives oftenest in houses in the walls or cracks, has acclimated itself in many large cities, such as Paris, Lyons, London, Copenhagen, Hamburg, etc. It causes often great damage by boring holes in furniture to establish its galleries, and by infesting eatables.

Last year on quitting Metz, where I was born and which I did not wish to leave, I came to Reims, and in the apartments which I occupied on Talleyrand street I found in a cupboard, with a quantity of neuters of Monomorium, a half dozen females, of which two had wings, and three males. Happy in discovering the two sexes, which I did not possess, I resolved to search for other specimens, and, if possible, to find the nest itself.

During the winter I saw a few neuters crawling through the dining-room, but nothing revealed to me the presence of any nest, and, until midsummer, although the neuters became more numerous, not a single sexual individual came under my observation. Where, then, was the nest to be found? The sideboards in the dining-room and a new cupboard were particularly frequented by neuter ants, allured by the victuals which were customarily shut up there; but after having several times explored all the corners of these places it became evident that the nest was not to be found there. Ants crawled in numbers upon the floor, where they profited by the falling crumbs from the table; they were going besides in large numbers towards a side of the room where the floor was loosely joined; it was in these clefts of the floor that they disappeared, only to return again to take their food. My neighbor has his pastry oven on that side, and he knows this little ant very well, with its dainty taste for sweetmeats as well as meat. To destroy them he places on the ground, from time to time, ham bones, and the next day he finds them covered with ants, which he destroys by throwing the whole into the fire.

The neighborhood of a pastry shop affords me the advantage of being visited by Blatta (*Kakerlak orientalis*), also *Blatta germanica*, that I kill without mercy; for when I used to allow one to stay on the floor the ants would immediately attack it, and, one hour after, I would see it covered with a hundred ants feeding on the juices contained in its body, which they left whole on the floor.

In the month of August, when flies are numerous in the apartments, I used every day to kill three scores of them which I deposited on a piece of paper in a corner and my boarders would not fail to attend the feast. A big spider was given to them and they liked it so much that by the next day the abdomen had all disappeared; the solid parts, the thorax and feet, remained entire. Sugared fruits and chocolate receive their attention also, but they do not damage them particularly, these substances being too hard for their mandibles. Fallen crumbs answer their purpose better. They do not seem to meet in numbers to carry the least piece of anything away to their nest; they seem to be sure they will always find something to feed on in our houses. Undoubtedly they disgorge to their larvæ the fluid part of the substances they have eaten. No one realizes how little such small animals want.

Up to September 15 I had not perceived either males or females. I then decided to use a more succulent bait, and tried ox liver; I placed a few bits of 5 or 6 centimeters in diameter on a paper, and three or four times a day I shook the paper in a benzine box; thousands of neuters dropped, and at last some males and females. After eight days of search I had taken 20 females, only one of which was winged, and 8 males. From the 16th of September to the 9th of October I captured 131 females, of which two were winged, and 60 males (about 6 females and 3 males per day); from the 10th to the 15th of October I captured 269 females and 90 males (about 54 females and 18 males per day); then the number decreased, and from the 15th to the 25th of October I caught only 159 females, 3 of which were winged, and 74 males (about 16 females and 7 males per day). In all, from the 15th of September to the 25th of October I had therefore captured 577 females, only 14 of which were winged, and 239 males.

In order to know approximately the number of neuters I had taken I counted 1,000 of them, of which the weight was 0.058 gram; 1 gram would therefore contain about 17,000, and as I had gathered 20.56 grams it gives a total of 349,500 neuters secured in six weeks (about 9,000 per day), and this figure is rather below the reality, for I have killed or thrown into the fire a great many of them that were not weighed.

However large these figures may seem, the supply was not exhausted, and every day I saw just as many neuters; the number of the sexual individuals only diminished. I then lifted the wash-board and two boards of the inlaid floor, hoping to find there larvæ and nymphs in their cocoons, but I was disappointed, for clefts in the wall showed me that the progeny of my ants were undoubtedly in the thick wall or in my neighbor's house.

I said at first that the injury by these small beings was almost inappreciable; only the abdomen of a spider had been destroyed, as also the abdomen of a few flies slightly eaten. The bits of raw liver I used as baits did not look damaged after a few days' service, though they were every day covered with ants which fed probably only on blood at

first. The pieces which I left to dry up, and which attracted them as well as the fresh liver, were at last furrowed with channels more or less deep. One of these pieces, which served for a score of days, was completely dug through into the center and only the exterior parts remained, which were hardened and bored with holes. In that condition ants were crowding all over them always in as large numbers as at first. How many thousands of ants worked at that piece to reduce it to that condition? Two or three thousand ants working day and night. When I had shaken the piece to gather all the workers, these were replaced an hour after by others; at 11 o'clock at night I found as many as at 7 o'clock in the morning, which proves that the work of the neuters does not stop. The result of these observations, few as they are, seems to determine the time of hatching out of the sexes, which seems to be at the end of September and during the whole month of October. This hatching takes place, of course, successively like the coupling, contrary to what occurs in most species in our country, whose coupling takes place in the air, and of which each female becomes the founder of a new formicary, while the males, becoming useless, die after having wandered aimlessly for a few days. Here, on the contrary, coupling takes place subterraneously, and it appears that the male and female continue to live in the same formicary, which increases indefinitely so long as nothing of an unforeseen character happens to destroy it.

Females lose their wings, of course, immediately after coupling, the superior ones first, for I found several which yet possessed their inferior wings. Their walk is slow, while males, preserving all their wings, run very quickly without my having seen any showing signs of flying away. It may possibly be different in Africa under the influence of a warmer sun than we have in our temperate climate.*

THE DIPTEROUS PARASITE OF DIABROTICA SOROR.

By D. W. COQUILLETT, *Los Angeles.*

Up to the present time but few instances have been recorded of Coleopterous insects being subject to the attacks of Dipterous parasites. In his first report as State Entomologist of Missouri, Professor Riley records having bred the Tachinid, *Exorista* (*Lydella*) *doryphoræ* Riley, from the larvæ of the Colorado Potato-beetle (*Doryphora* 10-*lineata* Say), and in the fifth volume of the *American Naturalist* Dr. Henry Shimer gives an account of the Dexid, *Melanosphora diabroticæ* Shimer,

* Mr. Bellevoye continued to gather these ants during the whole month of November. The neuters were a little less numerous; there was a complete absence of males, but the females were always present, and he captured 203 of them from the first of November to the 6th of December, only there were none with wings, which seems to indicate that there was not another brood of males and females.

which preys on the Striped Squash-beetle (*Diabrotica vittata* Fabr.). In the *Annales de la Societé Entomologique de France* for the month of June, 1888, Mr. M. H. Lucas gives an account of the parasitism of the Tachinid, *Myobia pumila* Macq., on the Asparagus Beetle (*Crioceris asparagi* Linn.), and on page 408 of his well-known *Guide to the Study of Insects* Dr. Packard quotes the French entomologist, Dufour, as authority for the statement that the Tachinids, *Cassidomyia* and *Hyalomyia*, prey respectively on the Tortoise-beetle, *Cassida*, and on the Curculionid *Brachyderes*.

The above are the only published references upon this subject that I have been able to find among the limited literature at my command.

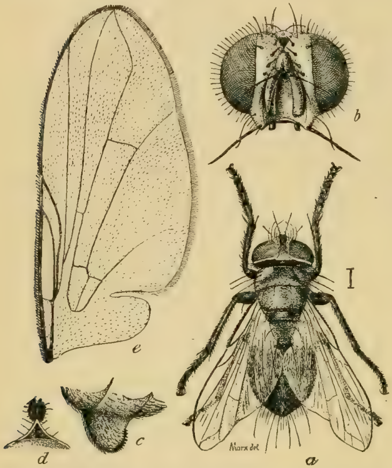


FIG. 46.—*Celatoria crawii*: *a*, adult fly; *b*, head of same from front; *c*, abdominal appendage from side; *d*, abdominal appendage from behind; *e*, wing showing venation—all enlarged (original).

On the 17th of June, 1888, I obtained several Dipterous pupæ from the abdomen of a dead *Calosoma perigrinator* Guér., and three flies issued from these pupæ on the 25th of the same month; they belong to the genus *Masicera* of Macquart, but the species is still undetermined.

On the 21st of June, 1889, I saw a Dipterous larva issue from the abdomen of an adult *Diabrotica soror* Lec.; it soon afterward pupated, the fly issuing on the 5th of the following month. Since this time I have succeeded in obtaining quite a number of the pupæ of this parasite, the flies from which issued at various times during the month of August. The larva in issuing usually breaks away the larger portion of the beetle's abdomen, and pupates wherever it chances to find a resting place—in a depression of a leaf, in the axil, or on the ground, making no attempt at concealing itself. Among a large series of beetles examined fully one-third contained larvæ of this parasite, each infested beetle containing only a single larva.

This parasite is very interesting, not only on account of the fact that it aids the horticulturist in lessening the attacks of the destructive Diabroticas, but also on account of the peculiar structure of the male abdomen, the second segment of which has a large flattened process on the underside—a peculiarity which does not exist in any other Dipteron known to me, nor can I find any reference to it in any work upon this

subject to which I have access. I submitted a sketch of it, together with an extensive description of both sexes, to Dr. S. W. Williston, our best authority upon this group of insects, and he writes me that he never saw such a process in any species that he has examined, nor can he find any published reference to it; he further states that the other characters of this species agree quite well with those of the genus *Baumhauria*, a single species of which has heretofore been described, having been bred from a Bombycid belonging to the genus *Arctia*. Our species, however, differs very decidedly from the above genus by characters other than the abdominal process, and therefore I do not think we run any great risk in erecting a new genus for its reception, a description of which I append herewith :

CELATORIA, n. gen.—*Head* large, broad as thorax, much broader than high; front in male only slightly wider, in female one-fourth wider than transverse diameter of eye—in both sexes with a single row of bristles each side of frontal stripe extending nearly to insertion of arista, and with two forwardly directed bristles on the crown outside of each of these rows; face much retreating below, bristles bordering median foveæ strong, extending nearly to the lowest in frontal row; vibrissal bristle strong; epistoma but slightly projecting; cheeks small, bristly; palpi well-developed, thickening toward its tip; proboscis soft, wholly retractile, furnished with a large labella; antennæ reaching nearly to oral margin, third joint at least four times as long as the second, rather slender and nearly of an equal width, the upper edge nearly straight; arista sub-basal, very short pubescent, distinctly two-jointed, second joint greatly attenuated on its apical half. *Eyes* bare. *Thorax* nearly as long as the abdomen, furnished with stout bristles. *Scutellum* with three pairs of marginal bristles and a shorter pair of dorsal ones. *Abdomen* oval, thinly depressed pilose, and with several pairs of dorsal bristles besides the usual lateral and anal ones; five abdominal segments, the first nearly as long as the second, the fifth in the male small, in the female concealed in the fourth; venter in the female normal, in the male furnished with a large, longitudinally compressed process on underside of second segment, apex of this process studded with numerous small tubercles; a large cavity in posterior end of venter, inclosing the fifth segment and contracted anteriorly into a narrow groove which extends to the second segment. *Legs* furnished with bristles; posterior tibiæ not ciliated. *Wings* of the usual Muscid type, first posterior cell terminating close to tip of wing, closed in the margin; curvature of the fourth vein in middle of last section of that vein, rounded, and destitute of an appendage; great cross-vein slightly nearer to this curvature than to the small cross-vein, nearly perpendicular; a stout bristle at junction of second and third veins.

Type, *Celatoria crawii* n. sp., which may be further characterized as follows:

M le. Frontal vitta blackish-brown, sides of front white, tinged with yellow; face white; palpi reddish-yellow; antennæ black. Thorax grayish-black, destitute of stripes, the bristles not disposed in rows. Scutellum grayish-black. Abdomen black, mottled with gray, destitute of reddish spots; fifth segment scarcely one-fourth as long as the fourth; a posterior dorsal pair of bristles on the first and second-segments, and a posterior transverse row of bristles on the third, fourth, and fifth segments, besides several along the sides of the abdomen; venter concolorous with the dorsum. Legs black, claws and pulvilli much shorter than last tarsal joint. Wings hyaline. Alulæ white. Halteres yellow.

Female. Same as the male except that there is a median pair of bristles on the second, third, and fourth segments. Length 4½ to 5½^{mm}.

Described from three males and two females, bred from adults of *Diabrotica soror* Lec., at Los Angeles, Cal.

PUPARIUM.—Dark brown, cylindrical, the ends rounded; quite thickly covered with black spines of varying lengths, some of the longer ones converging and adhering to each other, forming clusters of from 8 to 14 spines; length $4\frac{1}{2}^{mm}$.

I have dedicated this interesting species to my friend, Mr. Alexander Craw, who first discovered the existence of this parasite and to whom I am indebted for several specimens of the pupa.

SPILOSOMA FULIGINOSA LINN.

By O. LUGGER, *St. Anthony Park, Minn.*

Quite a number of insects are common to northern Europe, Asia, and America. The above insect must be added to these circumpolar species, as it occurs rather abundantly near the experiment station at St. Anthony Park, Minn. Nor is it a recent importation, as I have found it here in some old collections made about twenty years ago.

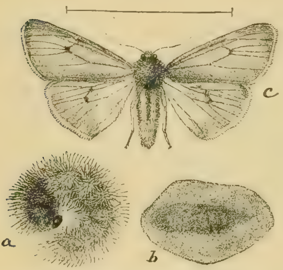


FIG. 47.—*Spilosoma fuliginosa*; *a*, larva: *b*, cocoon; *c*, moth—slightly enlarged (original).

This moth is interesting in many respects. Although I hunted for its larva quite frequently during the summer of 1888 and 1889, I never succeeded in finding it. But late in the autumn, and at a time when the sidewalks are covered every morning with a thick layer of frost, these larvæ are rather abundant. They leave their hiding places and crawl over the sidewalks; at this time they are frequently themselves incrusted with crystals of ice. Some few days ago, with the thermometer ranging from 5° to 3° below zero, I found several of them crawling slowly through the snow. When the sidewalks, made of boards, become warmed up by the rays of the sun, the caterpillars crawl away to the shady and cooler part. The caterpillar has the usual Arctiid shape, is intensely black, and densely covered with hairs, which are pale yellowish near the anterior and posterior ends, but of a dingy pale brown in the central region. The head is polished black.

As I have at present no larvæ, I can not give a closer description, but the illustration will give a good idea of their general appearance. The larvæ are most common wherever the sidewalks are laid in close proximity to clover, yet they are also met with in the vicinity of wild grasses and plants. As soon as such a larva is taken in doors and put into a breeding cage, it will crawl for a few days and soon commence to form

a cocoon. This is of a regular oval shape, made of fine threads of dirty white silk, intermixed with a few hairs from the body of the caterpillar. In the course of about ten days the pupal stage is assumed. The pupa is intensely black, highly polished, with rather sparse punctuations. The sutures are reddish brown. If kept in a cool room, the moths commence to issue early in April of the following season, though in a warm room some issued as early as the 3d of February.

The moth, Fig. 47*c*, has rusty black upper wings; the scales are not very close, so that the venation is plainly visible. The under wings are of a similar color, but much lighter, and possess a brick-red, ill-defined space at posterior margin. Both upper and lower wings, with the exception of their anterior margins, are fringed with pale red. Head, thorax, legs, and first two joints of abdomen are rusty brown. The abdomen is blackish, densely covered with rather coarse brick-red hairs; a dorsal and two lateral stripes are blackish. The femora of front legs are bright red. The whole underside of wings is pale reddish brown. Antennæ white, with blackish tips.

This rather handsome moth is very peculiar in its motions. It does not rest like other Arctiids in a more or less perpendicular position upon stems of plants, but prefers some dead leaves, under which it hides. If such a leaf is removed, the moth will rapidly run away to hide again, this time perhaps under a loose lump of soil.

The following extract from my notes illustrates the remarkable vitality of this insect:

December 3, 1889. Found to-day in a little depression of the soil a clear cake of ice, and imbedded in it the larva of the above species. By means of a hot iron I separated a cube of ice with the inclosed larva, and took it to my office. The caterpillar was entirely and solidly inclosed by the ice; no air-spaces could be detected among the hair. How long the caterpillar had been inclosed I could not say. Left the cube of ice in front of my window, where the temperature sunk for two days to 11° below zero. Later the weather moderated, and during the day a little ice would melt near the caterpillar, but never exposing it to the air. After being inclosed for fourteen days, I carefully melted the ice and removed the caterpillar to a piece of blotting paper. In less than thirty minutes the larva was crawling about, not injured in the least. Yet, to escape further experimentation, it has shown good sense and spun up, and transformed into a pupa, healthy to all appearances.

A GRUB SUPPOSED TO HAVE TRAVELED IN THE HUMAN BODY.

During June last we received a communication from Dr. Elizabeth R. Kane, of Kane, McKean County, Pa., from which the following is an extract:

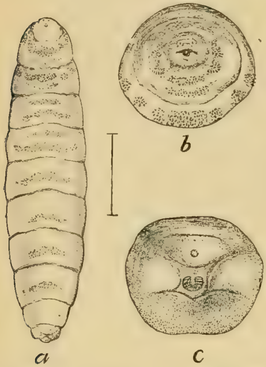


FIG. 48.—Hypoderma larva taken from boy: *a*, ventral surface—enlarged; *b*, anterior end; *c*, anal end—still more enlarged (original).

Numbers 3 and 7 of Vol. 1 of INSECT LIFE contain papers on Larvæ infesting Man and the Squirrel. A case occurring in the practice of Dr. Silvanus D. Freeman, of Smethport, McKean County, Pa, may not be without interest, as touching points alluded to in both papers.

On the 22d of February, 1889, Dr. F. visited a child residing in the country. He had been sent for some days previously, but being unable to go himself had sent his assistant, who reported a threatening of erysipelas. As the child was still suffering, the parents sent again for Dr. Freeman. He found the ear and the tissues around it much swollen, and the swelling plainly erysipelatous. Yet there was no sign of constitutional disturbance, the tongue was clean, breath sweet, and temperature normal. The child, a boy three or four years old, was lively enough to play during the day, but in sufficient pain not to sleep at night. The mother remarked that the cause of suffering was a "pollywog" working under the skin, but no particular attention was paid to the observation.

On February 28, the doctor again visited the child. The swelling under and behind the ear was gone, but a red line of inflammation went up to the under eyelid and then down the cheek. The mother stated that the eye had been closed for twenty-four hours by the swelling, which had traveled about 2 inches since the doctor's first visit, and seemed now about to "point" in the cheek. Placing his finger on the inside, the doctor detected a foreign body in the swelling, which he lanced, and squeezed slightly. A living grub emerged, a little less than half an inch long while living, a little over that when it died a few hours after. Dr. Freeman questioned the child's mother closely and learned that she had first noticed what she called the "pollywog" five months before. It was then under the skin near the sternal end of the right clavicle, and in the five months had traveled (appearing as a tiny lump followed by a red line of inflammation) up and down the chest in front, down one arm as far as the elbow, and over one side of the back, never crossing the median line. Sometimes it had "pointed" and they thought it would come out, but its course had continued on again. Until within a few weeks it had given the child little annoyance, but latterly its nights had been very restless. The mother thought that the "pollywog" traveled at night because she had never detected its movements, and because the child seemed more easy in the day-time. Its increasing suffering was probably caused by the increase of growth of the grub. Taken out February 28, when was the egg deposited? Its movements had been noticed five months before.

A careful examination was made of it under the microscope, and a description written out and sent to an entomologist, who advised the doctor to apply to the Department for Vol. 1 of INSECT LIFE. He found that Dr. Rudolph Matas had figured in No. 3 of that volume a grub found under the skin of certain laborers on the Central American works, who had been stung while bathing, and appeared to be infested

with boils. These contained larvæ. Dr. Matas pictured a differently shaped grub from that found by Dr. Freeman, in that the Central American one has a large head and diminishes rapidly towards the caudal end.

In describing Dr. Freeman's grub, he mentions twelve rows of curved black bristles pointing backwards, which he called ciliated epithelia. At the caudal end the three first rings had several pads of these bristles. Dr. Freeman supposed that the maggot propelled itself by their aid. Dr. Matas depicts the same sort of bristles and considers their use to be to keep the grub stationary. He also speaks of the necessity of the maggot's obtaining air. Dr. Freeman's lived five months without it.

Dr. Freeman supposes his grub to be the larva of a gad-fly, as the sting of these insects is very annoying to both horses and human beings in McKean County. It closely resembled, except in being narrower in proportion to the length, the grub figured on page 214 of Vol. 1 of INSECT LIFE as the Emasculating Bot-fly.

I do not suppose that there is anything unusual in finding larvæ living in human flesh, but is not the traveling about unusual?

We immediately wrote Dr. Kane, expressing incredulity regarding the traveling of the grub from the elbow to the eye in the space of five months, and urged strongly that she endeavor to secure the specimen. She wrote to Dr. Freeman, who with great promptness forwarded the specimen in alcohol with the following note:

I am not only willing but anxious the grub be sent to Washington for determination. The evidence of both father and mother, after describing the "pollywog" appearance in its track should be very strong evidence of its being migratory, but putting their statements all aside, I have positive knowledge of its movements, having first seen its track over the scapula, then up the neck to base of ear which was enormously swollen, from there to the outer corner of eye, which was entirely closed, then to middle of cheek where it was plainly felt, and the opening made and expelled. There is no chance for mistake in this case.

We have carefully examined the specimen with the result that it seems without doubt to be a species of *Hypoderma* and closely resembles Brauer's figure of the early stage of *H. diana*, which infests deer in Europe, as also the same stage of the common *H. bovis*.

We have shown this larva at figure 48, *a* representing the entire larva, *b* showing the head, and *c* the anal end of the body. We place the matter on record for what it is worth. The extensive traveling reported we might be inclined to doubt, were it not for the confirmatory evidence in the case of *H. bovis*, published in this issue by Dr. Curtice.

THE DOGWOOD SAW-FLY.

Harpiphorus varianus Norton.

In a recent number of the *Garden and Forest* October 30, 1889, Vol. 2, p. 520), Mr. J. G. Jack presents an interesting article, illustrated by drawings by Mr. C. E. Faxon, under the title "A Destructive Cornel Saw-fly (*Harpiphorus varianus* Norton)," the larvæ of which for two or three years past have been quite destructive to the foliage of various Dogwoods in the Arnold Arboretum.

We have accumulated in the note-books of the Division a number of references to this insect, having first collected the larvæ on *Cornus paniculata* in Missouri in the fall of 1875. Since that time we have collected and received through our correspondents larvæ from various localities, and have succeeded on several occasions in rearing the adult insects. We had purposed to publish the natural history of this insect as soon as opportunity offered, but such publication is now rendered unnecessary in view of the excellent account of its habits and description of its several stages given by Mr. Jack. We will, however, in connection with a brief synopsis of Mr. Jack's paper, put on record our notes relating to the range, date of appearance, and habits of this insect.

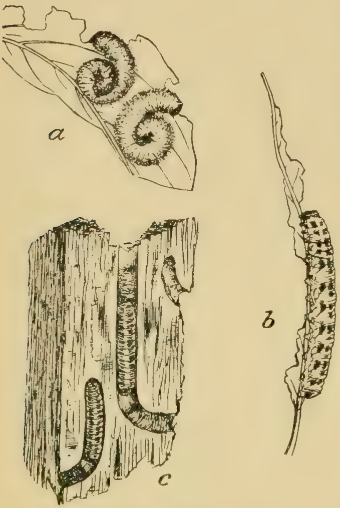


FIG. 49.—*Harpiphorus varianus*: *a*, larvæ before last molt; *b*, larva after last molt; *c*, larvæ in burrows in decaying wood—natural size (after Jack).

As stated above, the larvæ were collected in Missouri in the fall of 1875 on *Cornus paniculata*. These specimens soon entered soil and were found unchanged, excepting being much contracted, on March 23 of the spring following. No adults were obtained. September 27, 1877, larvæ were found on Cornus sp. at Kirkwood, Mo., and these entered soil October 5, but again the adults failed to appear. October 2, 1884, a number of larvæ of this insect were received from Mr. M. S. Crane, of Caldwell, N. J., who seems to have first discovered the peculiar hibernating habits of the larvæ, and who writes of them as follows:

I send you with this a box of saw-fly larvæ found feeding on *Cornus paniculata*. When about to change to a chrysalis the larvæ bore into decayed wood to transform. There are two broods in a season, and the last one remains in the wood until spring. For several years they have been very abundant, but this season they were much scarcer.

October 3 a number of the larvæ received from Mr. Crane bored into rotten wood placed in the breeding-case with them for that purpose. Flies issued from May 27 to June 5 of the year following. Another lot of larvæ was received from Mr. Crane September 2, 1885, concerning which he again writes:

I send you herewith a box of saw-fly larvæ found feeding on panicled dogwood (*C. paniculata*), a few of which I forwarded to you last year, and have not been able

to secure any more until a few days ago. Previous to last year they were very abundant, eating the foliage all off of many bushes. For several years I have tried to rear them in a glass jar and succeeded in bringing out one fly by putting a piece of partly decayed wood in the jar, which the larvæ entered to change.

An examination of the larvæ April 8, 1886, showed that they had not then changed to pupæ; the adults appeared from May 28 to June 8.

September 12, 1888, a number of saw-fly larvæ were received from J. G. Barlow, Cadet, Mo., which in every respect were like those previously obtained from Mr. Crane. They were, however, found feeding on the leaves of a wild grapevine, and also on *Polygonum dumetorum*. With us, however, they refused to feed on these plants, but wandered incessantly about in the breeding cage. Flies were obtained August 4 and 9, 1889.

Mr. Charles C. Beach of Hartford, Conn., wrote us in June last describing the habits of a peculiar spotted saw-fly larva found by him burrowing into decayed wood on which he supposed they subsisted. He had in the previous year sent specimens to Dr. A. S. Packard, who was unable to identify them, and who wanted additional material. In the absence of Dr. Packard in Europe, however, he communicated with us, and in compliance with our request forwarded us specimens of the larvæ and adults collected the present year, concerning which he writes under date of August 7, 1889, as follows:

I mailed you yesterday a package containing a number of the live larvæ of the saw-fly of which I wrote you last June; also a small bottle with two of the mature flies. Since the receipt of your letter of June 22 I have searched faithfully for more of the adults, but only succeeded in netting the two which I have sent you in alcohol. The colors have remained practically unchanged. In the box containing the larvæ you will see that most of the specimens are covered with a sort of white bloom, if their journey has not caused it to be rubbed off. This at times, or rather in some instances, is very abundant and continues through all the molts until after the last change, which takes place prior to pupating, when they appear of a black and yellow color and naked. I placed one such in the box with the others. At this stage they are exceedingly restless, ceasing to eat and being found at times a long distance from their food-plant. It is impossible to keep them in a bottle covered simply with gauze as they bite through it, but placed in a bottle with a few bits of dead wood, they make no attempt to escape, but proceed immediately to bore. I have some at present boring, having reached their last molt. When they are well settled in their winter habitat I will mail you some if you desire them.

The imago is a very pretty and active little creature, readily eluding the net, fighting and biting with vigor when captured. I do not know whether the two specimens I inclosed are of one sex or not.

The larvæ of this saw-fly are reported by Mr. C. L. Marlatt to occur not uncommonly at Manhattan, Kans., on Cornus sp.

Mr. Jack was at first unable to rear the adults, but in the spring of 1889, having accidentally found the larvæ burrowing in decaying wood picked up near Cornus bushes, he succeeded about the first of June in obtaining the perfect insects, the larvæ having pupated within the bur-

rows but a short time previous. The life history as given by Mr. Jack is as follows:

On June 10 the first eggs were discovered and within a few days they were quite abundant. The eggs are pale green, oblong, and about four one-hundredths of an inch in length. They are deposited singly within the tissue of the leaf on the upper side. From one or two dozen to three or four hundred eggs may be deposited within a single leaf without any very definite order, although most of them are usually disposed in lines parallel with the midrib, or with the principal veins. Each egg makes a little swelling, noticeable on both the upper and the under sides of the leaf, and, with a little practice, egg-bearing leaves may be readily detected.

On hatching, the larvæ emerge on the under side of the leaf. They are then about six one-hundredths of an inch long and pale green in color, with yellowish head and black eyes. When at rest they keep close together, coiled up on the under side of the leaves; and they appear to feed only in the cooler parts of the day, in cloudy weather, or perhaps at night. Of the first leaves attacked, they eat only the more tender parts, and the leaves are left somewhat skeletonized; but as the larvæ get older they devour every part of the leaf down to the midrib. After the first molt, when they are about twelve one-hundredths of an inch long, the larvæ secrete a peculiar, very white efflorescence, by which the back and sides become covered. This is constant after each molt until the last.

This efflorescence is removed by the slightest touch, and when brushed off the color of the body is a pale greenish white. The head after the first molt is black, and the legs and under sides of the body yellow. At full growth the average length of the larva is about an inch. Some are smaller than others, however, and this possibly indicates the difference of sexes.

When the larva has cast its skin for the last time a complete and surprising change has taken place. All trace of white is gone, and the body is greenish yellow on the back and yellow beneath and along the sides below the spiracles. On each segment along the back are two large and two small black spots, and upon the sides, close above the spiracles, is a row of nearly square, black spots, one for each segment, but so placed as to lap over from one segment to the next. The terminal plate above the ventral segment is black. The legs and prolegs are yellow, the former having a reddish spot on the outer side near the base. The tips of the claws are black. The great change produced by the last molt has led some observers to suppose that there are two distinct species.

Full growth is attained by most of the larvæ early in August, but some may not reach maturity until much later, and this season a few were noticed to pass the last molt about September 20. The season last year was not so advanced, and, in some places, large numbers of larvæ were found in September. The larvæ eat very little after the last molt, and very soon they leave the plant and wander away in search of suitable places in which to hibernate. Stray pieces of decaying wood, fence posts and rails, dead branches and the corky bark of old trees are selected. In the Arboretum, many were found even boring into the soft pith of dead stems of elder bushes. Sometimes two or more occupy one burrow. It is quite possible that some larvæ go into the ground to hibernate, but none have been discovered there.

Figures of the larvæ, showing characteristic position on leaves, and also the nature of their hibernating burrows in decaying wood, are reproduced from Mr. Faxon's figures.

We had identified adults as *H.* (*Emphytus*) *testaceus*, and after again carefully examining our specimens it seems probable that the species just named and *H. varianus* are identical. Those obtained from the larvæ received from Mr. Crane form a very good connecting series be-

tween the two species. Those bred from the larvæ sent by Mr. Barlow, together with the adults received from Mr. Beach, agree more closely with *H. varianus*. The variation even in the structural characters of the species is shown in that one female specimen in our collection has in the right anterior wing four perfect submarginal cells and in the left but three, the normal number, and in another female both anterior wings have four submarginal cells; the other specimens are normal. When it is remembered that the number of submarginal cells is used to separate a group of genera, including *Harpiphorus*, *Emphytus*, and *Dolerus*, the confusion likely to result from such variation may be better understood.

The male, of which we have but a single specimen, is much smaller than the smallest female, and the sides of its flattened abdomen are nearly parallel, differing markedly in this respect from the much broader and pointed abdomen of the other sex. In size as well as color there is a wide variation in our specimens, the length ranging from 10^{mm} to 15^{mm}. In color the flies are honey-yellow and reddish, with the thorax and head more or less marked with black; the former in typical specimens being almost entirely black. The four terminal joints of the antennæ, the labrum, tegulæ, scutel, feet, and portions of the legs, white. The two basal joints and more or less of the third joint of the antennæ are reddish. The apical portion of the third joint in all of our specimens and the fourth and fifth joints are brownish black. The basal half of the wings is clear; the outer portion, smoky.

This insect has been recorded from Connecticut, New York, Virginia, Illinois, Massachusetts, and Canada; and *E. testaceus*, which is probably the same insect, from Pennsylvania and Virginia. To these localities we have added New Jersey, Missouri, and Kansas. In Cresson's Catalogue of Described Hymenoptera it is accredited to the United States and Canada.

Of insect enemies, Mr. Jack mentions a number of Hemiptera observed by him to feed on the larva, and he also observed, but failed to secure, a minute fly which was apparently ovipositing upon its eggs.

Certain species of Cornus (*C. florida* and *C. mas*) were found by Mr. Jack not to be attacked by this insect, but the foliage of *C. sericea*, *C. alba*, *C. stolonifera*, *C. paniculata*, *C. sanguinea*, *C. asperifolia*, and one or two others were greedily devoured. Polygonum and Wild Grape may be doubtfully added to the list of its food-plants. Our failure to get the larvæ received from Mr. Barlow to feed on these plants makes additional observations on this point desirable.

PLATYPSYLLUS—EGG AND ULTIMATE LARVA.*

By C. V. Riley.

The egg and the pupa of *Platypsyllus* are yet unknown. I have for some time endeavored to obtain them, and specimens recently received as such gave hope, from the finder's account, that the lacunæ in the life-history of the genus might at last be filled. But examination dispelled the hope; yet not without adding something to our knowledge of the development of this curious beaver parasite. The only reference to the egg is that contained in Dr. Horn's article in the "Transactions of the American Entomological Society" (Vol. XV, p. 25), where it is stated that the eggs were observed, and that "they are minute objects, not fastened to the hair, as is the case with lice, but plastered firmly to the skin among the thickest hair." This, failing in description, might apply to the egg of any other minute creature, and I have, in fact, some reason for concluding that the objects referred to in the observation were not the eggs of *Platypsyllus*, but those of quite a different insect. The eggs, as observed in the oviduct of the female *Platypsyllus*, are sufficiently uncharacteristic, except as to their flattened form; they are 0.4^{mm} long and 0.2^{mm} in broadest diameter, non-sculptured, white, broadly ovoid, but much flattened on two sides. The structure indicates that they may either be thrust under the scales of the skin or fastened thereto.

What was sent as the pupa, proves to be a most interesting larval stage and in keeping with the Mallophagous appearance of the beetle. This larval stage might at first sight be characterized as a Mallophagan by even the most careful zoölogist. The larva, as hitherto described and figured, even in the largest specimens, whether from Dr. Horn's material or my own, has always seemed to me inexplicably small as compared with the imago, and if the form which I now describe is (and I can believe it nothing else) the final larval form of *Platypsyllus*, then the larvæ hitherto described had not yet gone through their final molt. A glance at the accompanying figures suffices to show the remarkable superficial resemblance to the lice in question, and only when the structure, especially of the leg and mouth-parts is studied, does its *Platypsyllus* nature appear. The description will also show how greatly it is modified from the earlier larval stages already described. One is justified from the facilities for grasping which it possesses, as from the position of the head, in inferring this stage quiescent, and in this respect, as well as in the marked deviation from the previous stage, it recalls the pseudo-pupa, or coarctate larva of the Meloids, and of some other parasitic forms. I have but a single specimen and have not been able to clearly make out the spiracles. One can but conjecture as to whether the pupa proper is formed, either partially or wholly, within the skin

* Reprinted from *Entomologica Americana*, February, 1890, p. 27.

of this broadened larva, or whether the skin is completely exuviated in the transformation.

I hope that those who have opportunity to capture beavers will endeavor to obtain the much-desired pupa, and I shall be most glad to communicate with or to receive specimens from any one having such opportunity.

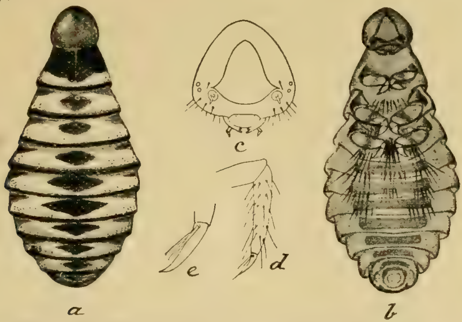


Fig. 50.—*Platypsyllus castoris*, ultimate larva: *a*, dorsal; *b*, ventral view; *c*, head from beneath; *d*, tarsus; *e*. tarsal claw (after Riley).

PLATYPSYLLUS CASTORIS.—*Ultimate Larva*—Length about 2.4^{mm}; greatest diameter about 1.2^{mm}. Nirmiform, flattened, narrowest at thoracic joints and broadest at middle of abdomen. Color grayish white, with brownish, chitinous markings. Head pale brown, peculiar, projecting from joint 1, subtriangular, flattened, occiput without structure, face and vertex completely ventral; the mandibles resting on the prosternum, rather stout and 2-toothed; clypeus very large, triangular; antennæ very small, 3-jointed, inserted in front of the lateral angles of the clypeus, the basal joint rather large, circular, flattened disc-like, the second joint minute, as long as broad; the terminal joint much longer, slender, cylindrical, and bearing a stout bristle at tip; labrum transparent and membranous; palpi apparently 4 jointed (not distinctly made out) the terminal joint cylindrical, about one-half longer than wide and truncated at tip; just outside the antennæ are two black ocelli and several piliferous raised points. Legs rather short, stout, drawn in over the sternum; the tarsi spinose, long, 1-jointed, bearing but a single, long, quite straight claw, with two long, movable spines at base; tibiæ with but a few spines near tip. Dorsally, the prothorax is twice as long as the other joints, which are subequal in width, and the transverse brown markings include the prothorax, except a narrow posterior band, a narrow posterior border across each of the joints (obsolescing on 10, 11 and 12); a median subrhomboidal spot and a subdorsal narrower, somewhat paler spot near the anterior margin of each of joints 2–11. The posterior half of each joint is also beset with numerous pale brown granulations (obsolete on 11 and 12), but without a trace of hair. Ventrally, the thoracic joints are much lengthened, the femora show

a transverse shade and the abdominal joints a dusky transverse band, shorter and more conspicuous anally. Patches of long, stout bristles occur on the dusky parts of joints 4, 5, 6, 7 more particularly, and of shorter bristles on the sternum.*

SOME NEW PARASITES OF THE GRAIN PLANT-LOUSE.

By L. O. HOWARD.

Among the numerous parasites of the Grain Plant-louse reared the past summer and referred to in INSECT LIFE, Vol. II, page 31, are the three following new species. As they belong to groups which I have studied I present the following descriptions at Professor Riley's desire:

There has been considerable doubt concerning the true habits of the species of *Pachyneuron*. It has, beyond question, been bred from Syrphid larvæ in the Division of Entomology and by Mr. Hubbard, in Florida. Professor Cook considered a species reared by him as a Bark-louse parasite, but with the evidence before us at that time I surmised that it might have come from unnoticed Syrphid larvæ. In the same way I was first inclined to discredit Mr. Ashmead's reported rearing of this genus from Aphidids, but Mr. Ashmead tells me that he is quite positive that it does actually feed in plant-lice and the facts concerned in the rearing of the present species seem to indorse his opinion. Our first specimens were reared July 12, 1889, from grain-lice sent from Goshen, Ind., by Mr. Webster and we subsequently reared a rather large series (20 specimens mounted) from lice from different localities in the same State. While it was not observed to actually issue from the lice there seems little chance that Syrphids could have been present in the small mass in such numbers to have harbored such large quantities of the parasites.

FIG. 51.—*Pachyneuron micans*, female—enlarged (original).

The genus *Megaspilus* has been rarely reared in this country. A species has been reared from the Hop Plant-louse in the Division of Entomology and a rather large series from the Grain-louse. I am not familiar with any references to its habits in Europe. The subfamily to which it belongs contains other genera of plant-louse parasites, viz., *Ceraphron* and *Lygocerus*.

PACHYNEURON MICANS, n. sp.

Female.—Length, 1.28^{mm}; expanse, 2.1^{mm}; greatest width of forewing, 0.46^{mm}. Antennæ short; funicle as long as width of head; first funicle joint succeeding ring-joints as broad as long, not compressed; succeeding joints increasing gradually in

* Since this was written, I have ascertained that the spiracles are extremely minute and placed laterally on the posterior border of the joints. The two spots on penultimate joint bordered by short spines correspond to the bases of the cerci.

width, not in length, to club, which is oval, compressed, nearly as long as preceding three joints together; entire funicle with short, appressed hairs. Face and head very delicately shagreened; mesonotum finely punctate; mesoscutum very short and regularly convex, not pointed; metascutum rather strongly punctate near middle, smoother at sides, central carina rounded; abdomen flat, subcampanulate, or oval, nearly as broad as thorax. General color metallic bluish, greenish, or bronzy black; antennæ and all coxæ metallic; all femora metallic on the outside, tipped with dull yellow; tibiæ honey yellow; tarsi somewhat darker, last joint brown.

Male.—Differs as follows: Antennæ longer than in female; pile of funicle longer, more erect, and dirty white instead of silvery white. Abdomen much narrower than thorax, campanulate in shape. The femoral bands are brown instead of metallic, and the hind tibiæ have each a light brown central band.

Described from many male and female specimens reared from *Siphonophora avenæ* from Lafayette and Goshen, Ind.

MEGASPILUS NIGER, n. sp.

Female.—Length, 1.6mm; expanse, 3.33mm; greatest width of fore-wing, 0.62mm. Scape of antennæ very long, somewhat swollen beyond middle; funicle long, curved, all joints increasing gradually in width from pedicel to club; joint 1 of funicle somewhat longer than pedicel, joint 3 shorter, joints 4 to 8 increasing in length very slightly. Head and mesonotum very faintly shagreened, but still glistening; lower portion of mesopleura and all of abdomen perfectly smooth. Abdomen subovoid in shape, acutely pointed at tip. Radial vein only slightly curved, extending a little more than half way from stigma to tip of wing. General color jet black; all trochanters, femora and wing veins dark brown; all tibiæ and tarsi lighter brown.

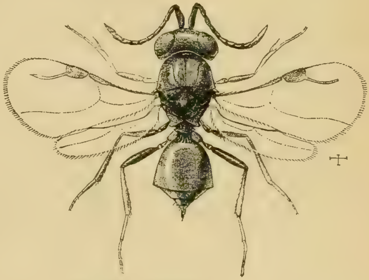


FIG. 52.—*Megaspilus niger*, female—enlarged (original).

Described from five female specimens reared from *Siphonophora avenæ* from Selkirk, Mich., and Lafayette, Ind., July, 1889.

ENCYRTUS WEBSTERI, n. sp.

Female.—Length, 0.93mm; expanse of wings, 2.1mm; greatest width of forewing, 0.35mm. Antennæ short, inserted considerably below the middle of the face; scape cylindrical, not widened below, reaching to vertex; pedicel conical, longer than first funicle joint; all funicle joints as wide as long, the sixth somewhat compressed laterally; club a little longer than last two funicle joints, oval, compressed laterally. Front as broad as one of the eyes, finely shagreened, with sparse, large punctures; ocelli at the angles of a right angle triangle; occipital angle sharp, mesonotum shining, with extremely fine striation; mesoscutellum finely shagreened. Marginal vein wanting; stigmal somewhat longer than postmarginal; wings hyaline; cilia short. Color: Scape of antennæ, all of head, mesoscutum, abdomen and hind thighs, metallic blue-green; funicle of antennæ brown; mes-

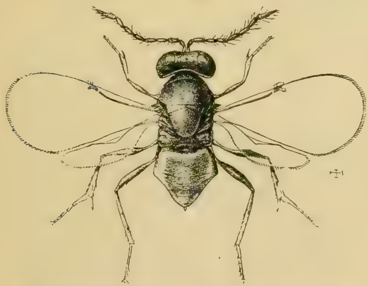


FIG. 53.—*Encyrtus Websteri*, male—enlarged (original).

oscutellum bronzy; front and middle femora nearly black with very slight metallic lustre; trochanters and femero-tibial joints yellow; tips of all tibiæ yellow; all tarsi yellow; mesopleura brilliant metallic blue; metapleura shining metallic green.

Male.—Length, 0.8^{mm}, expanse of wings, 1.9^{mm}, greatest width of forewings, 0.35^{mm}; differs from female in its more somber color, the general effect being brown rather than metallic although the mesonotum and head are somewhat lustrous; the antennæ are cylindrical, the segments well separated subcylindrical and furnished with short, finely distributed hair. The general color of the legs is darker; the bands at the joints being narrow and darker; hind tarsi dusky, middle and front tarsi yellow except last joint.

Described from one male and one female reared from *Siphonophora avenæ* by F. M. Webster, at Lafayette, Ind.

This species comes rather close to *Encyrtus clavellatus* Dalman reared in Europe from Cecidomyid galls on willow, but is specifically distinct.

AN AUSTRALIAN HYMENOPTEROUS PARASITE OF THE FLUTED SCALE.

By C. V. Riley.

We have just received from Mr. F. S. Crawford, of Adelaide, the first Hymenopterous parasite of Icerya yet found in Australia. It is

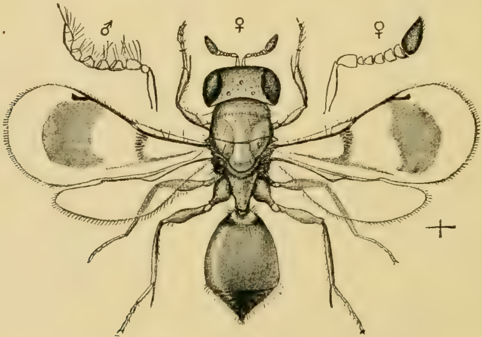


Fig. 54.—*Ophelosia crawfordi*, enlarged (original).

a very interesting form belonging to a new genus, and as it will doubtless become an important factor in the life-chances of Icerya, and it will be convenient to refer to it definitely by name, we take this occasion to characterize it. Its nearest relative is *Dilophogaster californica* Howard, which breeds rapidly in California and is a noted enemy of the Black Scale (*Lecanium oleæ*). So valuable a species is this last that Professor Comstock found that on some trees 75 per cent of the scales were destroyed by it, while in no case was the scale found without its attendant destroyer. Moreover, Mr. Coquillett writes us that in 1889,

at Orange, Cal., fully 80 per cent. of the black scales were killed by this parasite.

From these facts it seems probable that the discovery of the new insect will prove important and we have initiated efforts to secure living specimens from Australia. The few facts which Mr. Crawford gives concerning it we quote from his letter of November 24, 1889:

"I received some three months ago some Icerya from a place some 50 miles South of Adelaide, the owner of the orchard not having seen anything of the kind before and wanting to know what they were. These I placed as usual in a bottle loosely stoppered with with cotton wool. With the Icerya was a Chrysopa larva, which for some weeks was feeding on the eggs. One day on examining it I discovered several hymenopters (Proctotrupidæ?), the female yellowish brown, the male almost black. On examination I found that many might have escaped through the cotton stopping being insecure, but I suppose that I have bred about thirty since. It is strange that this is the only instance of a Hymenopterous parasite of the Icerya yet discovered in South Australia. I send you a few of these under separate cover. I presume the small black insect is the male. * * *

Since the following description was drawn up we have received a report* by Mr. Henry Tryon, assistant curator of the Queensland Museum at Brisbane, in which he describes, without name, a Chalcidid parasite of Icerya which he says is very common about Brisbane, and which he believes is responsible for the rarity of Icerya in that vicinity. A careful perusal of his description leads us to believe that he had our insect before him; but as he has proposed no name ours will hold. It is very encouraging to learn that the species is so abundant.

OPHELOSIA, n. g.

Closely resembles in habitus *Dilophogaster* Howard (See Ann. Rept. Dept. Agr., 1880, p. 368, where it is described as *Tomocera*, subsequently changed to *Dilophogaster* on account of the preoccupation of *Tomocera* in *Thysanura*), with which it agrees in many characters, but from which it is sharply defined. The antennal peculiarities are identical in the two forms, viz: The simple, clavate, 10-jointed female antennæ, and the compressed, serrate, hairy, 9-jointed male form. The wings in *Ophelosia* differ markedly, as follows: The sub-marginal vein is not curved downward; the marginal is more than twice as long as stigmal; just below the bend of the sub-marginal in the female is a broad patch of very stout bristles arising from the wing surface. The petiole of the abdomen is nearly as long as the width of the metascutum; the fimbriæ of the callus are very dense, but short. The tufts of hair at base of abdomen are sparse. The hind tibiæ are furnished at tip with a long, slender, slightly-curved spine, nearly as long as first tarsal joint, while in *Dilophogaster* it is entirely unarmed.

O. CRAWFORDI, n. sp.

Female.—Length, 2^{mm}; expanse, 4^{mm}. General color honey-yellow, somewhat darker dorsally than ventrally. Head: face and vertex strongly transverse-rugose; ocelli concolorous; eyes darker; antennæ with club more dusky and with joints 2–6 of flagellum paler than the rest. Thorax: pronotum and mesonotum plainly shagreened, with sparse, appressed concolorous pile; mesoscutellum faintly striate; lateral parts of mesoscutum strongly rugose, the centre faintly so; the four mesoscutellar piliferous tubercles as also the hairs, black, a small spot behind each tegula and the lateral parts of the mesoscutum black or blackish; fimbria of metascutum white;

*This report will be reviewed at length in the next number of INSECT LIFE.

wings with a narrow curved transverse dusky band reaching from the bend of the submarginal vein to hind border of wing including the patch of wing bristles; also with a large nearly circular dusky shade below stigma and reaching nearly across wing; legs uniformly honey-yellow with the coxæ sometimes brownish above. Abdomen with basal joint dark brown, and more or less brown at sides and near tip.

Male.—Slightly smaller; sculpture identical throughout. Pile very inconspicuous, dark. General color black, shining; all legs honey-yellow; the upper sides of the hind femora and tibæ somewhat darkened; hind coxæ black; front and middle coxæ honey-yellow at tip; antennæ with the scape honey-yellow, and the funicle brownish; wings perfectly hyaline.

Described from four female and two male specimens reared by F. S. Crawford, at Adelaide, from specimens of *Icerya purchasi* received from S. Australia, 50 miles south of Adelaide.

EXTRACTS FROM CORRESPONDENCE.

The Orchid Isosoma in America.

A friend of mine, by occupation a florist, has applied to me for information concerning an insect pest affecting the genus of orchids known as *Cattleya*, more especially *C. trianæ*, *eldorado*, and *gigas*. Said insect belongs to a group I have studied but very little, and as the matter is of general interest I appeal to you.

During the resting season of these plants the pseudo-bulb will sometimes be observed to suddenly start into activity, increasing rapidly in size and becoming swollen spherically. On examination this enlargement is found to contain a cavity in which are several (3 to 8) insects. Those which I have had an opportunity of studying were in the last stages of development; I inclose examples in the light-colored pupa stage, the dark-colored stage preparatory to transformation, and the adult. They make their escape by gnawing a hole from the cavity sufficiently large to allow their egress. The size of the cavity is dependent on the number and state of development of its inhabitants. The larvæ have been described to me as "little white grubs." All the adults that I have seen have had clear wings, but my friend states that is unusual; he has generally found them with dark wings, apparently identical. (I expected to find a Cynips, but is not this a Chalcid?) He thinks the pest is imported with the plants (which mostly come from New Granada), and finds comfortable quarters and a field for activity in greenhouses; he has found them in plants recently imported, together with unmistakable signs of their former presence.

Their depredations are followed by disastrous results. Of course no flowers are to be expected from the bulb attacked, and this abnormal growth taking place during the resting season so saps the vitality of the plant that it behaves as if it were attacked by slow consumption, the leaves lose their vigor and consistence, wither, fade, and gradually die in from one to two years after being seriously attacked.

Any information you can give me concerning this pest, its name, life history, habits, remedies, etc., will be very gratefully received. Will send you sketches of its work if desired.—[Albert P. Morse, South Natick, Mass.

REPLY.—Your letter of November 29, together with specimens of the Chalcidid reared from the pseudo-bulb of *Cattleya*, has been received. These specimens form a very desirable addition to the collection of the National Museum, for the reason that we already possessed the swellings from which they issue, and which were given us a few years since in France. Prof. J. O. Westwood, in the Transactions of the Entomological Society of London for 1882, figures and describes what is probably the same species under the name of *Isosoma orchidearum*. The specimens which you send us

differ slightly from those described by Westwood in the coloration of the legs, but this is too unimportant a character to base a new species upon. Prof. Westwood mentions the same insect in *The Gardener's Chronicle*, November 27, 1869, p. 230. I send you by same mail a copy of No. 4 of Vol. 1 of INSECT LIFE, on p. 121 of which you will find a note of our observations on this subject.

If you have plenty of material the most careful observations will be desirable, and if you can send us specimens of the work it will facilitate matters. We shall gladly publish any detailed account of your observations which you may care to write.—[December 3, 1889.]

A Flaxseed Mite.

I send you something by to-day's mail that greatly puzzles me. My father, who has just returned from Kansas, brought with him the bottle which I inclose, containing specimens of a mite, or what appears so to me, which is found in amazing quantities in a warehouse in Paola, Kans., among flaxseed, of which about four thousand bushels was in store there. Crawling masses of these mites several inches deep could be seen on some of the floors and the owner feared they would destroy the entire stock. I have opened a number of the seeds without finding any of the mites on the inside unless the seed happens to be somewhat crushed. I conjecture that the warehouse may be somewhat damp, and that these creatures are feeding on the débris of broken seeds, bits of hulls, stems, etc., which are in a state of partial decay. There was an almost unendurable stench in the compartments where the mites most abounded. What do you think of the matter? The owner of the infested seed is Mr. Z. Hayes, of Paola, Kans.—[Mary E. Murtfeldt, Kirkwood, Mo., December 10, 1889.

REPLY.—Yours of the 10th instant with specimens came safely to hand. The mite which is found in such amazing numbers in flaxseed in Kansas is a species of *Tyroglyphus* differing from any familiar to me; it is quite different from *T. longior*, the common flour and cheese mite. You are probably right in considering that the creatures were feeding upon the débris of the broken seeds, and that they were attracted by the state of partial decay.—[December 13, 1889.]

Abundance of Ægeria acerni.

Your kind favor of November 26, stating that my name had been added to the mailing list duly received with the first four numbers of Vol. 2 of Insect Life. I find them very interesting and instructive, and would ask you to accept my heartfelt thanks for them.

By far the most destructive pest in this city is *Ægeria acerni*. Nine-tenths of Detroit's shade trees are (soft) maple, and the damage done by the borer above named is very considerable. Have seen in June as many as fifteen pupa cases protruding from a single tree.

The inner bark is eaten, often nearly around the trunk, and as the tree grows it leaves either a large hole in the tree or a constriction nearly around it. Dozens of trees thus gouged and girdled are blown down with every high wind.

Trees from two to six inches in diameter seem to suffer the most from their ravages. Have tried several times to remedy the trees infested by painting the holes or rough places in May or June, thinking the moth would not deposit her eggs on painted trees, but the next year noticed pupa-cases protruding through holes in the paint by scores.

Any advice you may care to give me will be gratefully received.—[Charles A. Wiley, Detroit, Mich., December 2, 1889.

REPLY.—Your letter of the 2d instant is just received. We are obliged to you for the note concerning the abundance of *Ægeria acerni* in your city. You will find a full account of this insect with illustrations in my sixth Report on the Insects of Missouri (1874), pages 107 to 110. In my experience these worms are invariably found in such trees as have been injured either by the work of the flat-headed borer, by the

rubbing of the tree against a post or board, or in some other way. Where the bark has been kept smooth they do not seem to trouble it. The moth evidently prefers to lay her eggs in cracked or roughened parts. Any application, therefore, which will tend to keep the bark smooth will be of value.—[December 5, 1889.]

Hessian Fly in California.

This insect has been reported as being very abundant during spring (1889) in the central part of the State, destroying most of the wheat around Mt. Eden. Personally it was observed in the Santa Cruz Mountains on May 26. At this time they were found in all stages from young larvæ to pupæ and empty cases (puparia) within barley. Some of these collected the beginning of June produced flies until beginning of July; others collected beginning of July did not hatch up to date, October 30. A few parasites (*Semiotellus destructor*) were also bred; they had issued up to September. Flies are marked 443; parasites 443°; and a few Isosoma that had been bred from some straw 443^a. One small fly was also found in jar; this is marked 443^b. During September, 1887, a few puparia, evidently of this fly, were found near Alameda on two species of grass, one of these *Elymus americanus* and the second a species of *Agrostis*. Also during the last summer specimens and traces of such were found in the Santa Cruz Mountains upon several species of grass. This is without doubt the Hessian Fly. On October 1, 1889, I found larvæ still remaining within puparia collected in July.—[Albert Koebele, Alameda, Cal., October 30, 1889.

An Ivy Scale-insect.

I have an ivy vine which is badly diseased. Inclosed please find sample of leaves. The ivy is some 30 feet long and runs along the inside of my store. Had one of about the same length destroyed some 2 years ago by the same pest. Kindly inform me what to do to get rid of these pests.—[George Teuchert, Lake View, Ill, Dec. 2, 1889.

REPLY.—Your letter of the 2d instant, inclosing leaves of ivy infested by scale insect, has been received. The insect in question is the common *Aspidiotus nerii*, a cosmopolitan species which infests a great variety of plants, and is by no means confined to the ivy, although occurring commonly upon it. As a remedy I would advise you to spray with a dilute soap emulsion made according to the usual formula. [December 4, 1889.]

Ant Hills and Slugs.

I have resorted to many expedients to get rid of the ant hills that disfigure my lawn and sometimes seriously injure plants and shrubs, and have finally succeeded in conquering them. I first hive them—break up the nest pretty thoroughly and if it is near the roots of a plant draw as much of the débris as possible a little way from it and turn over it a large plant jar. The ants will promptly appropriate the jar, remove their larvæ to it, and fill it with pellets of earth. I then drench this with kerosene emulsion reduced to a strength of 2 to 3 per cent., which will kill every ant thoroughly drenched with it. It is more destructive to them than pure kerosene, which does not adhere to them. In this way I have thoroughly conquered the ants.

The rose slug and the currant worm I keep completely under by use of hellebore, a tablespoonful to a gallon of water, and forcing it violently among the foliage with a hydropult. Commencing in the spring before I can find a slug or a worm, and repeating the drenching once a week for three or four weeks, I can destroy them completely before they do any damage. On one hundred roses I was able this spring to find only two slugs, while the foliage of some common sorts I did not spray was completely destroyed.—[M. C. Read, Hudson, Ohio, September 5, 1889.

A curious Case of insect Litigation.

I recently learned of a case where the good work accomplished by the *Vedalia cardinalis* had been grossly ignored. It appears that a certain adventurer inoculated a number of Icerya-infested orange trees, with the understanding that if by this means he suc-

ceeded in destroying all of the Iceryas on these trees he was to receive a certain remuneration for his trouble. A few days after the trees had been inoculated, one of the county inspectors of fruit pests placed a number of the Vedalias in these trees without apprising the experimentor of this fact; at the appointed time the trees were carefully examined and not a living Icerya could be found on them. The experimentor claimed that it was through his inoculating the trees that the Iceryas had been destroyed; the owner of the trees, however, thought that the credit belonged to the Vedalias, and therefore refused to remunerate the quack for his work. Thereupon the latter gentleman brought suit against the owner of the trees and won it, the jury deciding that the fatality among the Iceryas was produced through the inoculation which the infested trees had received, notwithstanding the testimony of the inspector to the contrary, and the fact that the empty pupa cases of the Vedalia were still on the trees! This happened several months ago, at a time when the workings of the Vedalia were not so well known as at the present time.—[D. W. Coquillett, Los Angeles, Cal., December 12, 1889.

Two interesting Parasites.

I send some bottles containing larvæ in alcohol, and a few more slides with specimens for the microscope. Among the latter is an interesting parasite on *Aspidiotus uvæ*, which seems to be doing good work in keeping this pernicious scale-insect in check. More than a dozen of these little flies have emerged from the scales on a bit of cane not 5 inches long. In one of the bottles is a section of a Plusia larva found on Chrysanthemum from which thousands of the minute flies inclosed with it issued. I never saw a more extreme case of parasitism. After spinning up the poor worm lost all semblance to itself. A myriad of the parent flies must have attacked it at once.—[Mary E. Murtfeldt, Kirkwood, Mo., November 23, 1889.

REPLY.—Your parasite on *Aspidiotus uvæ* is a new species of the genus *Centrodora*, and the Plusia larva had evidently been attacked by *Copidosoma truncatellum*, which you will find mentioned as a parasite of *Plusia brassicæ* in my annual report for 1883, p. 121, Plate XI, fig. 6.

Work of White Ants.

I mail you a box to-day containing insects that have done remarkably good work. They bored through paper, then through a full bolt of Conestoga ticking into wood about one-fourth to three-eighths inch deep. The marks in wood were exactly the same as in the ticking I send you a sample of. When alive and killed with naptha (benzine) they drop a brownish fluid from the anus, which I suppose turns into dirt, as it shows on the ticking, lumps being attached to it where eaten, this extending through the whole bolt. The ticking was lying on a shelf (a place not very dark during the day) for about one month. Please let me know their name and habits.—[Eugene R. Fischer, 2707 Winnebago street, St. Louis, Mo., December 21, 1889.

REPLY.—The insect which has done this damage is the commonest of our so-called White Ants, and is known as *Termes flavipes*. This species bores in the woodwork of old buildings, and often does considerable damage. It is a difficult insect to fight, and about the only thing which you can do is to inject steam or hot water or kerosene wherever an opening seems to lead into their burrows in timbers.—[December 27, 1889.]

Importation of Orange Pests from Florida to California.

I am inspector of the Pomona fruit district. There will be a great many orange and lemon trees shipped from Florida this season. I would like to have you inform me of the places that are infested with Red Scale (*Aspidiotus ficus*) or other scales that would be dangerous in this climate, so that I can be on the lookout. Last winter I found Red Scale on trees that came from Orlando, Fla. I treated them with hydro-

cyanic acid gas and, I believe, killed all of them. Mr. H. G. Hubbard in his report of 1885 speaks of the Red Scale being in Orlando and San Mateo, Fla., but I presume they have spread to other places.—[C. C. Warren, Pomona, Cal., December 10, 1889.

REPLY.—Yours of the 10th instant has just come to hand. I can give you little or no information regarding injurious scale insects of other States which would be likely to be dangerous in California beyond what you will find in Hubbard's Report on Insects Affecting the Orange (1885) and the report on Scale Insects in the Annual Report of this Department for 1880. You are doubtless aware of the fact that the so-called Red Scale of Florida differs from the Red Scale of California.—[December 18, 1889.]

On some Dung Flies.

I send by the same mail that will take this for identification two apparently different species of flies. Those in the smaller bottle, black in color and smaller in size, I have noticed for a month past in great numbers in my poultry house in the barrel which receives the daily droppings. A paper is folded tightly over the barrel on which the cover is placed. On removing these the under side of the paper is often quite black with the minute insects. Mingled with these a few house flies of varying size are also seen, suggesting to me the thought that the minute ones are the early stage of the common house fly. Then comes the idea that most (is it all?) insects having the three stages make all their growth in the larva state and on reaching the imago state are at first of their full size. This is true, may I ask, of the house fly? If this one I send is a species by itself, please give me its name and direct me to its natural history. The other flies, of larger size, lighter color, and with reddish head, I have not noticed till this morning. The pans in which the hen's food is eaten are placed at night in the shed at an open window having a small mosquito screen and the blinds are always shut. On going to the pans this morning these flies arose from them in swarms. There must have been hundreds of them, though not one has been noticed before this year. These, however, are not new to us. We have always noticed them upon fruits, especially when injured, and about cider-mills. Please give its name. I should have said in writing of the others that on the paper where I saw so many of the small, black flies I also noticed crawling about among them other minute creatures of nearly the same size but wingless. Were they in any way related to them? Or can you tell what they probably are without specimens sent.—[S. D. Hunt, South Franklin, Mass., August 31, 1889.

REPLY.—The two flies sent are undoubtedly two different species: The black one can not be recognized without a careful examination and study of the specimens, but it is one of the *Drosophilidæ* and may belong to the genus *Stegana*. It is very distinct from the house fly, and does not belong to the same family. The other larger fly of lighter color is *Drosophila ampelophila* Loew, called by Professor Comstock the "Vine-loving Pomace-fly" An account of its natural history is given by Professor Comstock in the Annual Report of this Department for the years 1881–2, pp. 198–201.—[September 4, 1889.]

Spider Bites.

* * * In the fall of 1847, in southwestern Pennsylvania, I was called to treat a case of spider bite. I saw the young man two or three hours after he was bitten. The puncture was plainly seen on the wrist. The hand and arm were much swollen and the axillary glands swollen and painful. Knowing tincture of lobelia to be a specific in poisoning by poison ivy (*Rhus toxicodendron*), I had his arm enveloped with cloths saturated with the tincture, and gave enough internally to thoroughly empty his stomach. In twelve hours he was well, but the swelling lasted two or three days. That it was a spider bite I never knew, and always doubted. But in the coat-sleeve he had been putting on was a flat circular nest such as spiders often spin in the fall in garments hung in dark places. Those who believe in spider bites ought to show the fangs or other organs with which they can bite, and also the poison-secreting glands

and the poison sacs or cells. Till these are shown or till a spider is seen to bite a person, people will be incredulous.—[Dr. Wm. P. T. Coal, Meadows, Ill., September 3, 1889.

SECOND LETTER.—This morning my sister thought she was bitten by a spider under the sleeve near the wrist and almost immediately in two or three places between that and the shoulder. She crushed the insect with her hand, and on removing the clothes found the fragments which I send inclosed. If you can identify it I would like to know what it is. The bites or stings caused a slight pain and swelling that were gone in a few hours.—[Dr. Wm. P. T. Coal, Meadows, Ill., January 1, 1890.

REPLY.—Your letter of January 1 and the accompany fragments of a spider which is supposed to have bitten your sister have been received. The case is an interesting one and it is extremely unfortunate that the fragments will not enable a definite determination of the species, as the evidence is strong that the bite was made by this creature. Dr. Marx, our authority on spiders, states that the fragments show that the spider belonged to the family *Drassidæ*, and perhaps to the genus *Pythonissa*, the species of which live under stones but may also be found in outhouses. I am very much obliged to you for sending this specimen, and hope that if a similar case ever comes under your observation you will communicate it.—[January 7, 1890.]

GENERAL NOTES.

INSECTS AFFECTING SALSIFY.

Owing, possibly, to the fact that this vegetable is grown only in our gardens, and to a very limited extent, its insect enemies seem to have been but little studied. Mr. John Martin (10th Rep. St. Ent. Ill., p. 139), gives it as one of the food plants of the larvæ of *Prodenia lineatella*; but Mr. Martin seems to have provided it as food for the caterpillars while they were in confinement, they not seeking it from motives of choice; but this is the only species we have noticed on record as depredating upon it.

August 16 of the present year (1889), we found the foliage of these plants being eaten by larvæ, which, as they all fed from within leaves whose edges they had drawn together to form a hollow tube, appeared to belong to the same species. In some of these tubes small chrysalids were also found.

A quantity of infested leaves were gathered and placed in a breeding cage, in which there appeared on August 24 adults of a species of *Pædisca*, followed in a few days by other moths belonging to this species, *Dichelia sulfureana* and *Lophoderus triferana*. A number of larvæ were attacked by parasites, and on September 1 considerable numbers of a species of *Limneria* appeared.

While searching for the larvæ of the preceding a caterpillar of *Spilosoma virginica* was observed leisurely devouring the foliage of this plant, and, also, adults and pupæ of *Lygus pratensis* were noted in abundance among the tender leaves, some of them extracting the juices therefrom.

October 16, plants in this same garden were found to be infested with Aphides, and the top of one of the most thickly populated was removed and placed with living plants in a breeding cage. With the change to a warmer environment, the insects became more active, and instead of of a single species, as at first supposed, there were found to be four, three Aphides, viz, *Siphonophora* near *erigeronensis*, *Aphis* near *plantaginis*, at the time being studied on carrot and *Portulaca*, *Myzus mahaleb*, and a minute *Thrips*, their relative abundance being in the order in which they are here given. All three species of plant lice, and the *Thrips*, developed on the Salsify and remained upon it for several weeks, showing that their occurrence on plants in the garden was not accidental.—[F. M. Webster, December 12, 1889.

AN EGYPTIAN MEALY BUG.

We are indebted to our esteemed correspondent Mr. D. Morris, of the Royal Kew Gardens, for a copy of a letter from Mr. R. W. Blunfield of Alexandria, Egypt. During the past four years the gardens in Alexandria have been infested by a Coccus which destroys all of the trees and is causing the greatest alarm. It first appeared four years ago when Mr. Blunfield noticed it in quantities on the underside of the leaves of the Banyan tree, but it soon spread with extraordinary rapidity and some of the most beautiful gardens of the city full of tropical trees and shrubs have been also destroyed. A breeze sends the cottony pest down in showers in all directions. It seems to attack almost any plant, but the leaves of *Ficus ruginosa* and one or two other kinds of fig seem too tough for it and it will not touch them. He states that it seems almost impossible for a few horticulturists to try to eradicate this pest while their indifferent neighbors are harboring hot-beds of them, and there will have to be some strong measures taken by law to put it down.

Mr. Blunfield sent specimens which were referred to Mr. J. W. Douglas, one of the most prominent British students of Coccidæ, who upon cursory examination decided that it was a species of *Dactylopius*. At the time of this writing Mr. Douglas has not had time to examine it with sufficient care to determine the species. We have written advising the use of one of the resin washes which have proved so effectual against Icerya in California, and have mentioned particularly the one given on page 92 of the current volume of INSECT LIFE.

A CASE OF EXCESSIVE PARASITISM.

The frequency with which the Black Walnut is defoliated by the larvæ of *Datana ministra* has often been a source of regret to admirers of that beautiful and majestic tree. Every autumn, throughout the Western States, September finds many trees as devoid of foliage as in midwinter, the fruit hanging to the naked twigs with the very air of disconsolation. Trees in the forest do not appear to suffer, the caterpillars seeming to

prefer isolated individuals or small groups, which are usually planted for ornamentation.

Such a tree stands by the side of the walk midway between my home and the Indiana experiment station, being separated from all others of its kind by nearly a quarter of a mile. During the years 1884 and 1885 this tree was regularly defoliated in August. In 1886, during the usual season, the caterpillars made their appearance and began their work, reaching very near their full growth, when there was a sudden cessation of attack, and the depredators disappeared from the tree with astonishing rapidity, leaving the foliage less than half eaten. This was a change of affairs without a precedent.

An examination of the ground about and beneath the tree at once gave a clue to the mystery, revealing a state of affairs as interesting as unexpected. Everywhere among the short grass and weeds were caterpillars, some of them dead, others dying, while still others were quite active, but all well-nigh covered with eggs of a species of Tachina Fly. The flies were present in myriads, some of them winging their way about, a few inches above the surface of the ground, and others perched on grass, weeds, etc., all evidently watching for caterpillars, while the latter were as evidently hiding from their persecutors, for no sooner would one of them leave its seclusion than perhaps half a dozen flies would give chase, and begin fastening their eggs to various parts of the body, the victim writhing, twisting, and rolling itself about in the dust, in frantic efforts to escape. Even after gaining a place of security, under some leaf or plant, often some portion of the body would be left exposed, and the already half dead caterpillar would be again driven forth from its hiding, like a gored ox. Four caterpillars, fair examples of the whole lot, were forwarded to the Department at Washington, and to their bodies eggs were attached as follows: No. 1, 213; No. 2, 115; No. 3, 131; No. 4, 228. From five others, collected at the same time, we afterwards reared fifty-three adult flies.

During the years 1887 and 1888, not a caterpillar was observed on this tree, though others in the neighborhood were infested, but the present year (1889) they returned again in full force. It would be interesting to know if similar attacks by an allied Tachinid upon the Army Worm were as lasting in effect.—[F. M. Webster, November 28, 1889.

SOME HITHERTO UNRECORDED ENEMIES OF RASPBERRIES AND BLACKBERRIES.

Solenopsis fugax Latr.—These minute ants were observed in great abundance during July, 1886, burrowing into the ripe fruit of the blackberry. The food habits of the species must be exceedingly varied, as we have found them excavating and dragging away the substance of recently planted seed-corn, infesting dead crickets, burrowing into the fatty parts of cured hams, and in attendance upon a species of

Dactylopius infesting the roots of red clover, *Trifolium pratense* L. We have also found them burrowing in ripe apples.

Limonius auripilis Say.—We have observed the adult feeding upon ripe raspberries during July.

Carpophilus brachypterus Say.—These beetles are sometimes quite numerous in the fruit of the raspberry, especially if it be a little over-ripe. Their small size, and the habit of secreting themselves in the cavity of the berry about the receptacle, renders their presence difficult to detect.

Iulus impressus Say.—About the middle of July of the present year (1888) a lady of Lafayette purchased from her grocer a quantity of black raspberries for preserving. The case consisted of 16 quart-boxes, such as are usually employed for holding fruit. On looking the berries over, preparatory to cooking, she began to find these worms intermingled among and devouring the fruit. By the time a small portion of the supply had been inspected, upwards of fifty worms had been found, and the fruit was disposed of in a way rather more summary than that of preserving. Samples of both fruit and worms submitted to me left no doubt as to either the species of *Iulus* engaged, or its appetite for this kind of fruit. Whether the worms infested the fruit in the field, or whether the case was left on the ground and they made their way into the boxes, I was not able to learn, but the latter appears more probable.

Cosmopepla carnifex Fab.—This was reported to me from Livingston County, New York, as injuring the foliage of the black raspberry. See INSECT LIFE, vol. 1, p. 157.—[F. M. Webster, November 30, 1889.

NEBRASKA INSECTS.

We have just received from Prof. Lawrence Bruner his report to the Nebraska State Board of Agriculture for 1888. He considers a number of injurious species, including the Chinch Bug, the Corn Worm, the Box-elder Plant-louse, the Green-striped Maple-worm, the Willow Cimbex, the Apple-tree Flea-beetle, the Apple Twig-borer, the Corn Root-worm, the Army Worm, Cut Worms, the Box-elder Bug, the Imbricated Snout-beetle, the Sculptured Corn Sphenophorus, Tree Crickets, a new enemy to the Colorado Potato-beetle, Ox Warbles, Plum Curculio, Codling Moth, Strawberry Worms. The report is mainly compiled, but contains some account of the author's personal observations in Nebraska of the species mentioned. Among these we may note that the Army Worm is here recorded in injurious numbers for the first time in Nebraska. The damage by the Imbricated Snout-beetle to young corn is also of interest, while the illustrated article on the Box-elder Plant-louse is new. Under the article upon the Plum Curculio he mentions finding a species of *Coccotorus*, which he proposes to name *hirsutus*, feeding upon the Sand Cherry, in Cuming County. This we have since learned is the true *Coccotorus scutellaris* of Leconte (see note in INSECT

LIFE, Vol. I, p. 89) which, by the way, was originally found upon this same plant. Careful comparison of specimens, moreover, shows that the common Plum Gouger (*Anthonomus prunicida* Walsh) is unquestionably a good species, as such go, and not a synonym of *scutellaris* as has been supposed of late years. We illustrate both species at Figs. 55 and 56.

FIG. 55.—*Coccotorus scutellaris*—enlarged (original).

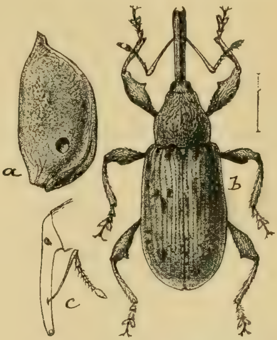


FIG. 56.—*Coccotorus prunicida* ; *a*, plum-stone showing exit-hole of larva ; *b*, adult ; *c*, side view of head of adult—enlarged (original).

A PODURID WHICH DESTROYS THE RED RUST OF WHEAT.

In studying the insect enemies of our cereals during the last five years we have repeatedly come in contact with a small, robust species of *Smynthurus*—species undetermined—both in the field and in breeding cages.

From the fact that we have several times reared the species in cages containing only growing grain and insects preying thereon, and were not able to detect them destroying either one of these, we have been perplexed to understand from what source these little Neuropters obtained their subsistence. During the present year, however, we have twice found individuals feeding upon the Uredo spores of the common wheat-rust, *Puccinia rubigovera*, in both instances on wheat growing in the field and at a time when the rust was first making its appearance on the leaves.

While these observations clear away some of the obscurity surrounding the food habits of these insects, their economic importance is as uncertain as before. We are free to suppose that all rust spores eaten by these insects are destroyed, and to this extent they are benefactors. But their bodies being covered with short bristles, and being such gormandizers in their method of feeding, with every repast they manage to get great numbers of spores caught among the bristles on their bodies, and these spores, it is fair to suppose, are carried away and probably become detached one time and another, more or less of them being left on plants not previously affected by rust. Early in the fall, when rust

is only commencing to appear on the young wheat, these *Smynthurus* might destroy many spores, but we have observed them enough to leave no doubt that they may transfer spores from one plant to another in the manner indicated.—[F. M. Webster, November 30, 1889.

INSECTICIDE LITIGATION.

We notice in *The San Francisco Morning Call* of November 22 a statement to the effect that a suit has been commenced in the superior court, by John S. Finch, owner of a ranch at Hayward's, Alameda County, against the Ongerth Grafting Compound Company, to recover $16,500 for losses sustained by reason of the application of the defendant's liquid compound to 106 fruit trees in order to destroy vermin and fungoid growths, whereby the trees were injured and killed. The compound cost Mr. Finch $10. Without any knowledge of the merits of this particular case we would state that we are glad to see the matter brought to trial in order that the responsibilities of the proprietors of patent insecticides may be legally defined.

NORTH EUROPEAN DRAGON FLIES.

We have just received from Dr. Filip Trybom a short paper, entitled "Trollsländor (Odonater) Insamlade under Svenska Expeditionen till Jenisei 1876," in which he describes eight species of Dragon Flies collected mainly in North Sweden, and some as far north as 69° 25′. Four of the species are new.

A CORRECTION.

Professor Forbes calls our attention to the fact that paragraph 6, on page 182, of the December number of INSECT LIFE, should read as follows:

> Mr. Forbes expressed himself as of the opinion that, from our present knowledge of the use of the arsenites as insecticides, they *can not* be recommended for use on the peach.

A PARASITE OF THE MEDITERRANEAN FLOUR-MOTH.

On page 170 of the last number of INSECT LIFE in our article upon this destructive grain pest we mentioned the fact that a small Ichneumon Fly destroyed this insect in the warehouses in the east end of London in the summer of 1887. At the time of writing this article we wrote to Mr. J. B. Bridgman, of Norwich, England, to ascertain whether he knew of this parasite, and have just received a reply in which he states that although he was not familiar with this instance he has since received specimens of *Chremylus rubiginosus* reared from *Ephestia kühniella*.

EFFECTS OF THE OPEN WINTER.

Two interesting effects of the mild weather which we have been having have been brought to our attention recently. December 20 Mr. G. A. Frierson, of Frierson's Mill, La., sent us specimens of the Turkey Gnat

Simulium meridionale), which had issued and were flying around at that date. January 4 he sent us other specimens of the Buffalo Gnat (*S. pecuarum*). January 6 Mr. P. P. Turner, of this city, brought us a living imago of the Fall Web-worm (*Hyphantria cunea*), which had recently issued from the cocoon. If this premature issuing of the latter species is at all general and we have subsequent severe weather the shade trees of Washington will not, in all probability, suffer the coming summer from Web-worms at least.

HONEY BEES AND ARSENICALS USED AS SPRAYS.

Mr. H. O. Kruschke, of Juneau County, Wisconsin, in the *American Garden* for January, 1890, p. 57, warns prospective sprayers that the first man caught applying arsenic to trees in full bloom will be prosecuted—reasoning that the spraying of such trees will result in the storage by the bees of poisoned honey, the consumption of which will be dangerous. In Vol. II, p. 84, of INSECT LIFE, the effect of arsenical insecticides on the honey-bee is briefly discussed, and a well-authenticated case is given which seems to show that such spraying is not attended with ill results either to the bees or the honey. The prevailing belief is, however, the other way, and cases are on record where serious destruction of bees has resulted from spraying. In the case of the Apple, particularly, the application should not be made until the bloom has begun to fall, when no injury will be likely to result. It was because of the possibility of danger that in the beginning we were very slow to recommend the wholesale spraying of orchards with the arsenical mixtures, but experience has shown here, as in other cases, judicious and cautious use is attended only with benefit, and that the possible harm is reduced to such a minimum as to almost justify its being left out of consideration.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

December 5, 1889. (Fifty-seventh regular meeting.)—The corresponding secretary reported additions to the library.

Professor Riley presented a communication on the ovipositors of Diptera in which he reviewed the general subject of piercing ovipositors in the different orders of insects, stating that in the order Diptera they were very rare, and calling attention to the fact that in *Trypeta* and some allied forms the ovipositor is capable of piercing, and that in *Trypeta pomonella* and in *T. lugens* he had found them to be readily capable of piercing the skins of apples and oranges respectively.

Professor Riley also presented a note upon the genus *Lestophonus*, showing that careful studies which he had made indicated that Mr. Skuse, of Australia, is correct in considering *L. monophlœbi* and *L. iceryæ* as distinct species, and not identical as supposed by Dr. Williston.

Professor Riley further presented a note on dipterous insects passed from the rectum of man, reviewing the older instances, and mentioned particularly the sending of *Eristalis dimidiatus* in the larva state by Dr. J. W. Compton, of Evansville, Ind., who stated that they were passed from the bowels of a young woman. He also mentioned

the recent sending of larvæ of *Eristalis tenax* by Dr. J. A. Lintner, to whom they had been sent as having been found under similar circumstances.

Mr. Ashmead read a paper on the Chalcid genus *Halidea*, in which he announced the finding in this country for the first time of a species of this genus, which superficially resembles *Eupelmus*, but is distinguished by the dilated posterior tibiæ and tarsi. The American specimen was captured by Mr. Schwarz at Harper's Ferry, and the species is named by Mr. Ashmead *Halidea schwarzii.*

Mr. Howard read a paper on the Hymenopterous parasites of *Ocneria dispar*, which is incorporated in the article on the Gipsy Moth in this number of INSECT LIFE.

Mr. Townsend presented a communication entitled "Further note on *Dissosteira carolina*," referring to his previous article in the *Canadian Entomologist* for September, 1884, on the peculiar aërial performances of this locust, and giving the results of observations during 1885 and 1886

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. MARCH, 1890.

Vol. II. No. 9.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE.

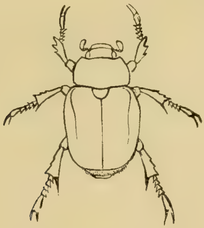
EDITED BY

C. V. RILEY, Entomologist,

AND

L. O. HOWARD, First Assistant,

WITH THE ASSISTANCE OF OTHER MEMBERS OF THE DIVISIONAL FORCE.



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SPECIAL NOTES.

Professor Atkinson's Bulletin on Nematode Root-galls.—We have recently received Bulletin No. 9, new series (Science Contributions, Vol. I, No. 1), of the Alabama Agricultural Experiment Station. It consists of "A preliminary Report on the Life-history and Metamorphoses of a Root-gall Nematode, *Heterodera radicicola* (Graef) Müll., and the injuries produced by it on the roots of various plants." It will be seen that the article deals with the subject of Bulletin No. 20 of this Division, prepared by Dr. Neal. Owing to the fact, stated in the preface to Bulletin No. 20, that Dr. Neal had not access to the literature of the subject, the investigation conducted by him aimed at the discovery of practical remedies rather than scientific accuracy.

The article of Professor Atkinson supplements Dr. Neal's work by giving a careful and accurate account of the life-history and habits of these worms; and as the author is evidently thoroughly familiar with the European writings on Nematodes, little is left to be desired in this direction.

The species is referred with little doubt to *Heterodera radicicola* Müll., which occurs commonly in central Europe in connection with a scarcely distinct species *H. schachtii* Schm. The genus *Heterodera* is shown to be world-wide in distribution. In addition to the species mentioned, one is found in Java in roots of sugar-cane;* in Brazil in roots of the coffee-tree, and one is also recorded from Scotland—all of which are scarcely distinguishable from *H. radicicola*. The structure and histological characteristics of diseased roots of various plants are discussed. The disease of potatoes known as the "potato-scab," the early stages of which are very like the Nematode galls on the potato tubers, the "club-foot" of cabbage, and the functional tubercles on the roots of Leguminoseæ, which have been shown to be of use to the plants in the acquisition of nitrogen, are carefully distinguished from the quite similar root-galls on these plants resulting from Nematode attack.

* See note on page 85 of the present volume.

No experiments were made looking to checking the injuries of this Nematode, and the various recommendations made are in general those already given by Dr. Neal. They consist in the use of various alkaline fertilizers, clean culture, and sterilization of the soil by a system of rotation which introduces crops not subject to their attacks. A German method is given of trapping the worms with catch plants ("Fangenpflanzen"), which are dug up and destroyed after becoming infested and before the worms have escaped.

In the vicinity of Auburn, Ala., some 36 species of plants were found to be affected with Nematode root-galls. A list of the works consulted, 36 in number, is given, most of which are European. The text is admirably supplemented with six plates showing affected roots, entire and in section, and the Nematode in its various stages.

Economic Entomology in India.—We are glad to see that the high standard inaugurated in No. 1 of the "Notes on Indian Entomology," editorially noticed in these pages a short time ago, is maintained in No. 2, which has just been published by the trustees of the Indian Museum, Calcutta.

Mr. E. C. Cotes contributes a translation of an unpublished paper by the late Dr. E. Becker on *Trycolypa bombycis*, a new Tachinid fly, parasitic on Indian silk-worms (*Bombyx fortunatus* and *Attacus ricini*), and figures larva, puparium, and imago.

He follows with original notes on two girdling beetles, *Cœlosterna scabrata* and *Neocerambyx holosericeus*. The former (allied to *Oncideres cingulatus* Say) affect Sal saplings; while *Plocederus pedestris* is found boring in Sal and Jungham, and its larva forms a calcareous egg-like case in which to pupate. A chrysomelid beetle, *Aulacophora abdominalis* G. and H., is destructive to *Cucurbitaceæ*—similar to some of our *Diabroticas* which also attack the Squash family.

Papilio erithonius Cramer produces a caterpillar in appearance like our orange dog, *Papilio cresphontes*, and like it is destructive to the Orange. He says:

> In sending them Mr. Gollan notices that the insect does much damage to young budded oranges, not a plant of which could be raised if boys were not kept to pick off the caterpillars.

A cut-worm, *Agrotis suffusa* (?), often does considerable injury to the young opium poppy, while our well-known Boll Worm, *Heliothis armigera*, is an established pest of the plant. Mr. Cotes says it was described by Mr. John Scott, in his opium report, as *Mamestra papaverorum*.

A brief note is given on *Cecidomyia oryzæ*, a fly allied to our "Hessian-fly," likely to become a serious pest to the rice plant.

Article XI treats of Insecticides, and extracts from some experiments with London purple, made by Mr. Gallan, superintendent of the Gov-

ernment Botanical Gardens, are given. It proved unsuccessful with a beetle on cucumbers, but a complete success in destroying a leaf-hopper, *Idiocerus* sp., on mango trees and a caterpillar on young orange trees. We are pleased to see that the kerosene emulsion, which we have so strongly recommended for the purpose, has been tried on the coffee scale, *Lecanium viride*, and proved eminently successful. Mr. Cotes says:

From Mr. R. H. Morris's experiments, carried out last year in the Nilgiris, there seemed every probability that kerosene emulsion could be effectively employed against the pest, and information has now been received of its having been successfully used in Ceylon over a sufficiently large area to test its practical applicability.

Several pages are then devoted to the life histories of scale insects found on coffee, *Lecanium viride*, *L. coffeæ*, and *L. nigrum*.

The publication terminates with a few notes on Rhynchota by Mr. E. T. Atkinson.

Mr. Tryon's Report on the Insect and Fungus Pests of Queensland.—We have just received from the Under Secretary for Agriculture of Queensland, Australia, a valuable addition to the knowledge of economic entomology and botany of that region in a "Report on Insect and Fungus Pests, No. 1 (1889) by Henry Tryon, Assistant Curator of the Queensland Museum." The work is a pamphlet of 238 pages, and is illustrated with 4 plates showing spraying apparatus. It is to be regretted that no illustrations are given of the pests treated of, and also that the work lacks a good index. It is carefully written, however, and the matter is excellently classified and arranged so that it will be a practical handbook of the subjects embraced, for orchardists and fruit-growers as well as working entomologists.

The author first treats the subject in a general way—discussing the relation of soil, state of cultivation and drainage to the increase of insect and fungus pests; the introduction and dissemination of pests, and the necessity of discriminating between friends and foes among insects, together with the protection of insectivorous birds, of which a list is given in an appendix.

A classified list of the fruits and cultivated plants of the Toowoomba district follows with a statement in connection with each plant of the principal insects and fungi infesting it. Each plant is afterward taken up in order and its various pests discussed at more length.

Two appendices are added, one relating to insecticide apparatus in which the Riley Nozzle together with certain compound forms is described and figured, and the other being the list of birds already referred to. The author displays a thorough familiarity with the writings of American and European entomologists, and in the discussion of many of the cosmopolitan insect pests, or those that are rapidly becoming so, he has quoted largely from the sources named. The similarity of the insect pests of the Toowoomba district with those of America and Europe enables him frequently to use the writings relating to the closely allied

species of older countries. Much of the matter is, however, new, and indicates considerable original investigation on the part of the author.

In this connection we will call attention to the very full account of the Fruit-fly, *Tephritis* sp., an insect closely allied and of similar habits to our *Trypeta pomonella*, but much more injurious and apparently the most serious fruit pest of the district. It infests not only the Apple and allied fruits but also the various stone and citrus fruits.

In connection with the excellent account of the Cottony Cushion-scale, a recognizable description without name is given of a hymenopterous parasite. This is the first published reference to a hymenopterous parasite of Icerya in Australia, and we have no difficulty in connecting the description with a species recently sent us by Mr. Crawford and which we described in the last number of INSECT LIFE as *Ophelosia crawfordi.*

These and other interesting features of the work which might be pointed out will give it a value to all engaged in entomological work.

SOME INSECT PESTS OF THE HOUSEHOLD.

C. V. RILEY.

[*Continued from page* 215.]

IV.—COCKROACHES.*

FIG. 57.—The Croton Bug or German Cockroach (*Phyllodromia germanica*): *a*, first stage; *b*, second stage; *c*, third stage; *d*, fourth stage; *e*, adult; *f*, adult female with egg-case; *g*, egg-case—enlarged; *h*, adult with wings spread—all natural size except *g*. (After Riley.)

The cockroaches which commonly annoy the American housekeeper comprise three species, one only of which is indigenous, and this the least harmful of the three. It is the "roach" or "black-beetle" of New England, and is known to science as *Periplaneta americana.* It measures from an inch and a quarter to an inch and three-quarters in length. Its thorax is yellowish with brown mottlings and its antennæ are exceptionally long, reaching considerably beyond the tips of the closed wings,

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* Reprinted substantially from *Good Housekeeping*, June 8, 1889.

which themselves are long and powerful and, when closed, reach beyond the tip of the abdomen. The species flies freely in the open air, but when it has once become comfortably domiciled in a kitchen or other favorable location it shows little disposition to use the wings, and, whenever suprised in its nocturnal foraging by sudden light of gas or candle, is content to scramble away on foot—frightened itself, yet too often frightening the overtimid and nervous.

The other two species have been introduced into this country from Europe, and indeed have been carried all over the world in ships, in which they particularly thrive, rendering even large vessels on long tropical journeys almost uninhabitable to fastidious persons. This is particularly true of the larger of the two, which is commonly called "the Oriental cockroach" (*Periplaneta orientalis*). This species is nearly black in color, and is not so large as the American roach, seldom reaching an inch in length. Its wings are also much shorter, not quite reaching to the tip of the abdomen. Its uniform, very dark mahogany color, is unmottled with yellow and its antennæ are relatively shorter than in the former species. It flies well, but not so strongly as *americana.* It swarms in enormous numbers in the holds of vessels, in basement kitchens, and in all dirty, damp places the world over, and is the most noisome and thoroughly disagreeble of all our household pests. A visit at nightfall to a badly infested room is by no means a pleasant experience, even to those not troubled with delicate nerves.

The third species is popularly known all over the country as the "Croton bug," although more properly it might be called the "German cockroach," for its scientific name is *Phyllodromia germanica.* It is also a European species and derives its common name from the fact that its first appearance in force in this country was synchronous with the completion of the Croton system of water-works in New York City. It had in all probability been brought over many years before, but had remained comparatively unnoticed until the extension of the water-works, with their numerous pipes in all residences and places of business, encouraged rapid spread and multiplication; for this species is more fond of water than the other two mentioned, and is often carried by pressure through water-pipes without injury.

The Croton bug is the most prominent cockroach in America to-day, and really does the most damage. It is enormously fecund, and its small size enables it to hide and breed in cracks into which the Oriental or American roaches could hardly push their front feet. When full-grown it never exceeds five-eighths of an inch from the front of the head to the tip of the closed wings, and it is much lighter in color than either of the others. Its color varies considerably, but it is usually of a very light brown with two darker longitudinal stripes on the thorax.

It is this species which I have chosen to figure in detail on account of its greater abundance and powers of destruction and from the fact that it occurs very numerously in northern localities where the other species

are seldom seen. Its transformations as shown in the figure will, however, represent in some degree those of the other species. All are closely related and probably pass through the same number of molts, the different stages repeating each other with comparative accuracy in the different species. At Fig. 57 the stages are shown lettered progressively from *a* to *h*. It will be noticed that none of these insects are winged until they cast their skin for the last time and the descriptive remarks which have preceded refer only to the full-grown insects. In point of color, however, they are moderately uniform, except that the newly hatched roaches are very pale—the Croton bug is nearly white—while all are of the same pale hue just after they have cast a skin.

The length of life of none of these species is accurately known, but as with other insects mentioned in this series of articles it doubtless depends largely on food-supply and temperature. They are all nearly omnivorous, but have at the same time preferences in diet. They seem on the whole to prefer animal matter to vegetable, but will eat after all kinds of cooks—good, bad, or indifferent. Almost everything which goes on the table is relished by them.

In the latitude of Washington and further south the Croton bug eats everything which contains paste, and, consequently, wall-paper, photographs, and especially certain kinds of cloth book-bindings suffer severely from their attacks. In a recent number of INSECT LIFE (Vol. I, p. 67) will be found an account of severe injury done to certain of the important files in the Treasury Department in Washington, the bindings of many important public documents being disfigured and destroyed. In the office of the United States Coast and Geodetic Survey they have become an intolerable nuisance by eating off the surface and particularly the blue and red paint from drawings of important maps.

But I need not elaborate further upon the damage which they do. How to kill them and prevent this damage is the question.

Without condemning other useful measures or remedies like borax, I would repeat here what I have already urged in these columns, viz, that in the free and persistent use of California Buhach, or some other fresh and reliable brand of Pyrethrum or Persian Insect Powder, we have the most satisfactory means of dealing with this and the other roaches mentioned.

Just before nightfall go into the infested rooms and puff it into all crevices, under base-boards, into the drawers and cracks of old furniture—in fact wherever there is a crack—and in the morning the floor will be covered with dead and dying or demoralized and paralyzed roaches, which may easily be swept up or otherwise collected and burned. With cleanliness and persistency in these methods the pest may be substantially driven out of a house, and should never be allowed to get full possession by immigrants from without.

For no other insect have so many quack remedies been urged and are so many newspaper remedies published. Many of them have their

good points, but the majority are worthless. In fact, rather than put faith in half of those which have been published it were better to rely on the recipe which T. A. Janvier gives in his charming article on "Mexican Superstitions and Folk-lore," published in a recent number of *Scribner's Magazine* (March, 1889, Vol. V, No. 3, p. 350), as current among the Mexicans:

To get rid of cockroaches—Catch three and put them in a bottle, and so carry them to where two roads cross. Here hold the bottle upside down, and as they fall out repeat aloud three *credos*. Then all the cockroaches in the house from which these three came will go away!

TWO SPIDER-EGG PARASITES.

By L. O. Howard.

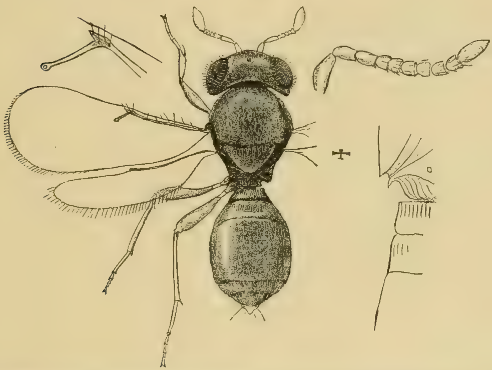

Fig. 58.—*Acoloides saitidis* Howard; female, showing wing veins—greatly enlarged; male antennæ and thorax from side—still more enlarged (original).

Following up the notes published from time to time in these pages on the subject of the hymenopterous parasites of spiders, I present below a description of two interesting new Proctotrupids of the subfamily Scelioninæ, the first of which was reared by Mr. L. Bruner at Lincoln, Nebr., from the eggs of the Araneid *Saitis pulex*. The eggs of this spider are a little more than a millimeter in circumference, and each egg harbors but one parasite, which issues by splitting the egg open rather than by gnawing a regular hole.

ACOLOIDES* n. g. (*Scelioninæ*).

Female antennæ with very large non-jointed club, and 4-jointed funicle. Male antennæ 12-jointed, submoniliform; club small, separable into three joints. Mandibles 3-dentate. Eyes hairy. Lateral ocelli situated on the eye margin. Mesoscutum

* Acolus + εἶδος.

without parapsidal sutures; mesoscutellum distinctly separated. Wings present. Submarginal vein reaching nearly to costa; marginal and postmarginal both exceedingly short; stigmal long, slender. Abdomen short, oval; first and second joints short, abdomen broadening rapidly from first joint; third joint very large; fourth and fifth visible.

It agrees with the points mentioned in the very insufficient characterization of Foerster's genus *Acolus*, except that it is winged. Foerster, however, knew only the female, and only mentions the fact that the antennal club is not jointed, and that the scutellum is developed, while the wings are absent or rudimentary.

Acoloides saitidis, n. sp.

Female.—Length, 1.4^{mm}; expanse, 3.6^{mm}; greatest width of fore-wing, 0.46^{mm}. Antennæ short; pedicel long, nearly one-half the length of scape; joint 1 of funicle one-half as long as pedicel; joints 2, 3, and 4 very short; club very large, oval, and one-third longer than four preceding joints together, but not quite as long as these joints and pedicel together; no articulations can be distinguished, but it is homologically composed of six joints. Eyes hairy; lateral ocelli touching the eye margin. Head, face, and mesonotum densely and finely punctate; parapsidal furrows not present; first and second abdominal segments with fine, close, longitudinal striæ, wanting at smooth posterior border; the very large third segment and short fourth densely and finely punctate, and clothed irregularly with short, whitish pile, which is also present, although sparser, upon the mesonotum, and is quite thick on the vertex; mesopleura finely punctate below; metapleura smooth. The marginal vein is very short and not quite coincident with costa; the post marginal is extremely short; the stigmal is long and slender and terminated by a small rounded knob. General color, deep black; all legs and antennæ honey yellow; all coxæ black, lighter at tips; scape brownish and pedicel darker than club.

Male.—Differs from female only in antennæ which are plainly 12-jointed; joint 1 of funicle as long as pedicel, joints 2 to 7 subequal in length and width, and each as broad as long and well separated; club oval, nearly as long as three preceding joints together. Antennæ uniformly honey yellow.

Described from 9 male, and 1 female specimens.

Genus BÆUS.

Minute wingless *Scelioninæ*, without differentiated scutellum and with non-jointed antennal club.

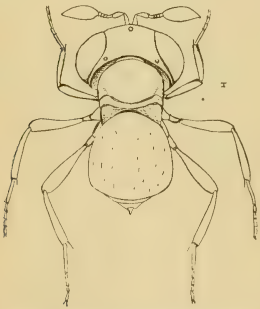

FIG. 59.—*Bæus americanus.* Female—greatly enlarged (original).

Bæus americanus n. sp.

Female.—Length 0.65^{mm}. Length of antennal club $.185^{mm}$, or in other words the entire body is only three and one-half times as long as the antennal club. Width of antennal club $.082^{mm}$. General color dark honey-yellow; scape and funicle of antennæ brownish, club lighter, dark at tip; vertex and face light honey-yellow; dorsum of thorax and abdomen dark honey-yellow, almost approaching mahogany; legs throughout concolorous with head; middle and hind tibiæ a little darker near base. Surface of abdomen smooth, shiny; mesonotum very faintly punctate. Thorax and abdomen with extremely fine, sparse, whitish pile; tip of abdomen with a short and contracted fringe of white pile. Antennal club very large, longer than rest of funicle and pedicel together; funicle joints very narrow and short, subequal, pedicel wider and as long as entire funicle except club.

This rather uncharacteristic description is drawn up from three poorly mounted and mutilated female specimens given me ten years ago by Dr. Marx, who I think received them from Col. Nicolas Pike, of Brooklyn, N. Y. They are labeled "Parasites in spider eggs in orange cocoon, collected 1871." After an examination of the eggs, Dr. Marx tells me that nothing can be said with certainty regarding the host except that it belonged to the family *Epeiridæ.*

No species of *Bæus* has yet been described in this country, although Mr. Pergande and myself have collected two or three undescribed species which are deposited in the National Museum collection. But one species is known in Europe—*B. seminulum* Haliday, but as I know of no recognizable description of it the present species is given a new name.

ON THE PARASITIC CASTRATION OF TYPHLOCYBA BY THE LARVA OF A HYMENOPTER (*Aphelopus melaleucus* DALM.), AND THAT OF A DIPTER (*Ateleneura spuria* MEIG.).

By M. A. GIARD.*

The larvæ of the Hymenopterous and Dipterous parasites of *Typhlocyba*, which I have described in a former communication,† belong: the first to *Aphelopus melaleucus* Dalman, the second to *Ateleneura spuria* Meig. (*A. velutina* Macq.; *Chalarus spurius* Schiner).

I have bred in captivity these two insects which have, as also their hosts, *Typhlocyba*, two yearly generations. The first infests the nymphs during the latter half of June, hatching about July 1; the other infests, the second generation of *Typhlocyba*, transforming in the nymphs towards the end of September or in October, and probably passing the winter in that state to yield the perfect insect the following spring.

If one compares these observations with the facts formerly described by Perris (parasitism of *Dryinus pedestris* Dalm. on *Athysanus maritimus* Perris) and by J. Mik (parasitism of *Gonatopus pilosus* Thoms. on *Deltocephalus xanthoneurus* Fieb.), it becomes very probable that Proctotrupids of the family *Dryinidæ* are generally parasites of Homopters of the family *Jassidæ.*

And again, in comparing the results of our investigations with the old ideas of Boheman on the infesting of various leaf-hoppers by Dipterous larvæ, in particular, of *Cicadula virescens* Fall. (*Thamnotettix sulphurella* Zett.) by the larva of *Pipunculus fuscipes* Fall., it becomes equally probable that the Dipters of the family *Pipunculidæ* are in general parasites of Homopters of the family *Jassidæ.*

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* Translated from *Comptes rendus*, Nov. 4, 1889 (Vol. cix, No. 19, pp. 708–710).

† See *Comptes rendus*, July 8, 1889.

We have been able to procure in abundance and study more completely than has heretofore been done the parasites (Dipterous and Hymenopterous) of *Typhlocyba*, up to the present considered as very rare and captured here and there accidentally.

We have been drawn also to occupy ourselves with some very curious effects of parasitic castration produced by these parasites on their hosts.

Typhlocyba sp., with yellowish or whitish elytra, form a small group of species living often side by side on the same trees and presenting among themselves a mimicry so perfect that it is almost impossible to distinguish them even by a very careful examination of the external characters. To James Edwards, of Norwich, Eng., belongs the credit of having recently attracted the attention of entomologists to the very marked distinctive characters which one can draw from the form of the genital armature of the male to separate these diverse species.

Aided by the work of that acute investigator we have discovered that the *Typhlocyba* of the chestnut, described in our first note under the name of *T. rosæ* L., belongs in reality to two distinct species, viz, *T. hippocastani* J. Edw. and *T. douglasi* J. Edw., which are equally common on the trees of the Luxembourg.

These two species may be parasitized by *Aphelopus* and by *Ateleneura*. But *Aphelopus* infests especially *T. hippocastani* and much less often *T. douglasi*. *Ateleneura* is found, on the contrary, almost always in *T. douglasi* and very rarely in *T. hippocastani*.

The females of *T. hippocastani* and *T. douglasi* are very difficult to distinguish. However, with *T. douglasi*, the ovipositor is more robust and presents only one curvature, while that of *T. hippocastani* is more slender and is doubly curved in the form of a cimeter. With individuals of both species parasitized by *Aphelopus*, the ovipositor is generally considerably reduced and incapable of puncturing. *Ateleneura* seems to have much less influence on the development of that organ.

The genital armature of the male presents some very salient distinctive characters. With *T. douglasi*, the penis is simple and the lateral pieces have the form of legs. The parasitic castration, whether by *Aphelopus* or by *Ateleneura*, induces but very slight modifications.

With *T. hippocastani*, the lateral pieces are slender, simple arcs, but the penis presents a very complex structure, being terminated by a very curious eight-branched fork.

With males parasitized by *Ateleneura*, and especially with those infested by *Aphelopus*, the penis suffers considerable reduction, having but six, four, or even but three branches. The specific characters are thus profoundly changed, and certain of these modified forms would be confounded on superficial examination with *T. roseæ* L. or *T. lethierryi* J. Edw.

Modifications not less great are observed in some singular organs of which the existence in the case of the males of *Typhlocyba* has not yet

been noted, so far as I know, and of which the function is altogether enigmatic. They proceed from two invaginations of the exoderm of the ventral side of the first abdominal segment and extend like fingers of a glove to the tip of the fourth segment and sometimes even a little beyond. These organs seem to me homologous to the similar sound organs of male grasshoppers.

With the males of *T. douglasi* and *T. hippocastani* infested either with *Ateleneura* or *Aphelopus*, the ventral invaginations are much reduced, they do not reach in general the second segment of the abdomen and often exist only as two small gussets on the first segment.

Aphelopus melaleucus appears to be rather common; I have found it at Wimereux and in the woods of Meudon infesting *T. hippocastani* and *T. ulmi* L., which live frequently together on the Elms in company with *T. opaca* J. Edw.

In these localities the sac which incloses the larva instead of being yellow, as with the individuals coming from the Luxembourg Garden, is, ordinarily, black. This color is evidently protective to the numerous individuals living on *T. ulmi*, of which the abdomen is black; and it is possible that it is due to heredity in the case of the others. Perhaps, also, *Aphelopus* presents varieties with the various species of *Typhlocyba*, which it infests. It is known, in fact, that Walker has described fifteen different forms of that Hymenopter, and by certain characters the specimens which he has figured differ a little from those which we have studied. Thus it has been impossible for me to find the least trace of the disk cells of the superior wing which, it is true, Walker has represented as very rudimentary. I can affirm further that the palpi possess five joints only, instead of six, which Walker has attributed to them.

It is possible, also, that under the name of *Ateleneura spuria* two allied species of *Ateleneura* have been confused. The rearing of larvæ collected with various Homopters will make the solution of this question easy.

A POISONOUS SPIDER IN MADAGASCAR.

Rev. Paul Camboué, missionary of the Society of Jesus at Tananarive, Madagascar, has recently sent us two papers by himself, the one published in *Les Missions Catholiques*, April 2, 1886, and the other in the *Bulletin Mensuel de la Soc. Nat. d'Acclimatation* on the subject of the beneficial and noxious spiders of Madagascar. What interests us most in these papers is the portion concerning the *Menavody*, a species of *Latrodectus*, a genus which in Madagascar as well as everywhere else is reputed to be very dangerous and to give even fatal bites. He quotes

Dr. Vinson in "de Flacourt's History of the Great Island of Madagascar" concerning the danger of the bite of this spider, and adds his personal experience, which we may freely translate as follows:

I was very desirous of falling in with this terrible spider when, on February 27, 1885, one of our little day scholars of the College of Tamatave brought me a specimen which he had found, so he told me, under a barrel. The child, never doubting the effect attributed to the bite of the spider, had taken it simply in his hand, carried it home and put it in a bottle and had not been injured in the least. I noticed that in this specimen one of the points on the upper surface of the abdomen was red. Having by mistake thrown the spider into alcohol I quickly drew it out again and happily it was still living. Next day it changed its skin and after the molt the spots on the upper side of the abdomen were four in number. The first and third white and the second and fourth red. It died soon after the molt.

The 23d of April following the same scholar brought me two more living females of the *Menavody*. I put them into a jar and was able to continue my observations. On the 24th one of the spiders laid her eggs in a little spherical mass, protected by the white or slightly brownish spheroid cocoon, about a centimeter in diameter, and suspended by a slight web of whitish silk. I had noticed that in this individual the series of spots on the middle of the abdomen did not exist, but were replaced by four depressions, placed in the form of a trapezium, and of the same color as the abdomen. The spider in repose remained below the web in the cocoon. Two little grasshoppers and the other spider were captured in its web and became its prey. It did not devour the substance of its victims, but left their outer skin intact. On the 27th a large living beetle was given to the *Menavody;* it was three times as big as the spider and vigorously defended itself. The *Menavody* displayed all of its means of offense. As it spun its thread it gave out a whitish viscous liquid, which did, it seemed, not a little to help it capture its prey. The beetle died only after a considerable time. On the 29th the spider laid its eggs for the second time. Its cocoon was like the former one. It rested between the two cocoons.

On the 4th of May another cocoon was produced. It then died, and on the 9th I found it at the bottom of the jar.

On the 27th of the same month of May, 1885, on lifting the bark of a large tree, I found several cocoons of the *Menavody*. The eggs from one of these cocoons hatched on June 12. On leaving the eggs the young are of a pale reddish color and the legs are brown. Fifteen days afterwards, on the approach of the first molt, this reddish tint grows darker, particularly on the abdomen. After the first molt, which takes place July 1, the spiders' bodies and the abdomen appear brownish. About the 20th of July a second molt took place. The young spiders killed each other, and there soon remained but two specimens in the jar, the male and the female. Wise disposition of the providence of the Creator and the Ruler of the Universe who thus prevents these venomous insects from multiplying without measure!

August 3, third molt. The red color of the triangular spot becomes more accentuated. The band upon the abdomen is of a slightly reddish white, the six lateral dots are white, those upon the middle of the back are four in number, three reddish white and the fourth white. The cephalothorax, abdomen, and legs have become of a darker color.

Upon the 7th I noticed that the male has become the prey of the female, who has killed him and enveloped him with her web. I continued my observations upon the latter.

August 15, fourth molt; 27, fifth molt. August 31, for the first time, I observed that she cleaned her nest and removed all the bodies of the prey.

September 15, sixth molt; September 26 two of the red spots in the middle of the abdomen, 3 and 4, disappeared.

October 11 she died.

I agree with an ancient writer on the subject of venom of this species: *

"Have spiders venom? Yes, they possess it, but its action is relative to the animal attacked. A fly pierced by a larger spider perishes in a few moments; other insects die more slowly, acording to their size; but a man bitten by a spider, even a large one around Paris, would not be hurt perhaps any more than by the bite of a gnat. In southern climates, however, where these creatures are larger, their wounds can be more serious. They appear to bring about local inflammations which, if the subject is healthy, have no serious consequences, but if the person is predisposed to the action of poison, if he neglects to take care of himself, the heat of the climate will bring more or less grave results, which in certain cases can bring about death."

In this way, upon the shores of Madagascar where the temperature is warm the bite of the *Menavody* is reported as more serious than in the interior of the island where the climate is cooler. In no place, however, does it seem to have more dangerous effects than that of other venomous insects, such as the *Scolopendra.* This opinion is confirmed by information which I have collected from several competent natives. It is related that the Marechal de Saxe was obliged to stop at a tavern where they had only one unoccupied bed, in which all of the travelers who had dared to sleep had died without the cause having ever been ascertained. The Marechal, notwithstanding, took possession of the fatal bed and made his servants sit at the side. Then at the end of some moments they were astonished and frightened to see their master grow pale and appear as if about to die, without seeing anything. In trying to revive him they saw upon his breast a large black spider which was sucking his blood, and which caused the death of the Marechal.

It is, if I do not deceive myself, with our *Vancoho* and *Menavody* as with the black spider of the Marechal de Saxe—the terrible effects of its bite exist only in legendary lore.

* * * * * * *

Since the publication of these notes [M. Camboué writes us], I have heard from the east shore of the island that it is not the bite of the spider, but contact with the crushed body, which produces the inoculation of venom bringing about the gravest symptoms with man and even with the Zebu. I hope later to be able to control the difficulty by inoculations upon different animals, such as poultry, rabbits, and sheep, and I will not fail to inform you of the result of my observations. Even now I believe that my conclusions in my notes are correct and that Latrodectus has without doubt a venom, but a venom whose noxious effect upon man varies with the crowd of circumstances (climate, temperament, etc).

EXTRACTS FROM CORRESPONDENCE.

Injury to Grass from Gastroidea polygoni.

In your reply to inquiry of N. R. Smithson, Winchester, Ill., on page 190, vol. 2, Insect Life, you state that this species injures no crop and feeds solely on weeds of the genus *Polygonum.* While this is true as a rule, there are exceptions. I have observed both larvæ and adults feeding on what seemed to be a species of dock, the specific name of which I do not know, but can ascertain in the future by further observation.

On June 22, 1886, two of the beetles were observed feeding upon heads of timothy, apparently eating both the involucre and incipient seeds. While the species may not be injurious, it will certainly bear watching.—[F. M. Webster, Lafayette, Ind., January 17, 1890.

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* Achille Percheron.

Resin Wash against Mealy Bug and Woolly Aphis.

My reason for not answering sooner your letter of January 2 (which was accompanied by report, and duly received) was occasioned through a desire on my part to thoroughly test and report correctly to you the results and effects of my experiments with resin wash upon the foliage of greenhouse plants. I have sprayed several delicate greenhouse plants with it, some of which had a considerable share of the mealy bug on. I have sprayed with from 1 to 12 and 16 per cent. and have seen no bad effects or any injury done to the foliage or plants from its use, while all the mealy bugs were entirely killed.

As to last year's experiments with it on Woolly Aphis and Plum Aphis, I can only say that it killed both, and I consider it a success when properly made and mixed and thoroughly applied with a fine spray.

There is one point to be observed: It should be applied early in the season, that is, as soon as the Woolly Aphis makes its appearance and before the leaves begin to turn yellow, which is caused by the Aphis destroying or checking the vital power that goes to nourish and sustain the leaves and causes them to drop, and which many people believe to be the cause of the wash.—[E. K. McLennan, Berkeley, Cal., February 13, 1888, to Mr. Koebele.

Dryocampa rubicunda.

I send with this some "worms" that are like the locusts of Egypt and "fill the houses." There were a good many last year, but this year they are innumerable. This is the second crop this season, and there was a white miller this spring in great numbers which I suspect to be the "mother of them all." The worms seem to eat nothing but the maples. I have hunted through such reports as I have but can not find out about it. I would like to know what it is and what we can do about it.—[Mrs. Mary T. McCluney, 214 East Sixth street, Sedalia, Mo., September 10, 1888.

REPLY.—The worms belong to the species *Dryocampa* (*Anisota*) *rubicunda*, which is popularly known as the Green-striped Maple-worm. These worms at times are very destructive to the Soft and Silvery Maples. The perfect insect varies somewhat in coloration according to locality. In the west it is nearly all a pale yellow color, with a very faint tinge of rose. The eastern individuals have the rose color quite intense on the front wings and generally a rosy band across the hind wings. In Missouri there are two broods of the insect in a year. In regard to remedies, there is no practical way of destroying them. The worms hold to the tree tenaciously and are not easily jarred down; and before entering the ground they scatter to great distances, so that they could not be found and destroyed while in the chrysalis state. However, this insect is seldom so exceedingly abundant two years in succession. The only directions that can be given to counteract its injuries are to keep close watch for the moths and eggs during the latter part of May, when large numbers of these may be destroyed, and to entrap the worms when they are about to leave the trees by digging a trench around the individual tree or around a grove of trees so affected. This trench should be at least a foot deep, with the outer walls slanting under, in which great numbers of the worms will collect and may easily be killed.—[September 19, 1888.]

Combined Spraying for Bark-lice and Codling Moth.

Having this day sprayed the apple-orchard of Rev. J. S. Fisher, of this place, with an emulsion according to your formula in letter to him of April 16th, I write you to report.

I would say that using one-half common soap, 2 gallons kerosene, and 28 gallons water, I sprayed about 60 trees, and 30 more were sprayed with the same proportion,

but using sealed kerosene, such as he had in his can and at his wish to save time, into which was put 12 gallons diluted emulsion and one-fourth pound London purple, thinking to destroy eggs and larvæ of codling moth at same time. The season has been so very late here that apples are only well formed, and I even saw some blossoms on late varieties. We had no apple blossoms for "memorial decorations." Having no microscope at hand I could not tell whether it was just the day to destroy the bark-lice, for the scales seemed to be still fast adhering to twigs. I have other years seen the young lice like yellow dots crawling out on the new wood, but did not see any yesterday.—[J. W. Van Deman, Benzonia, Mich., June 20, 1888.

Greenhouse Pests.

I send you some worms, and one pupa of same (I think), which feed on almost any soft-wooded greenhouse plants; also some flea beetles which feed on Fuschias. I do not think they feed on anything else; at least they do not with us. Both are very destructive, and so far nothing but hand-picking will destroy them. Can you tell me what they are and suggest any remedy for them?—[E. S. Miller, Wading River, Long Island, September 12, 1888.

REPLY.—The larvæ sent are those of *Botis harveyana*. This is a pyralid which has long been known to feed upon various greenhouse plants. The flea-beetles are *Graptodera exapta*. In case these insects are not very abundant, hand-picking will of course be the best remedy. If they should become very numerous an application of an arsenical solution may be made to the plants.—[September 14, 1888.]

Euphoria damaging green Corn.

I send you by to-day's mail three beetles that were found in an ear of sweet corn under the husks, eating the kernels of corn; there were four in the ear, but one got away. They had eaten the ear most all up. I would like to know to what family they belong, and whether they are an old or new enemy to the corn crop.—[Eugene O. Wheelock, Brooklyn, Wis., September 10, 1888.

REPLY.—The beetles belong to a common species, *Euphoria inda*. This species has long been known to attack injured fruit, and is often found congregating in numbers upon injured parts of trees feeding upon the sap. They have not been known to attack sound fruit to our knowledge. It is quite probable that the ear of corn in which you found them had been injured previously by birds or some other agency. We shall be very glad to have you investigate the matter and see whether they attack the corn *before* it has been injured; if so this will prove a new habit. These beetles belong to the same family as the June Beetle and the Rose Chafers.—[September 14, 1888.]

The Indian-meal Moth in Kansas.

I inclose herewith specimens of worms infesting our mill, which, in view of reports in milling journals, have given us some uneasiness. We have not noticed any moth likely to be the parent. The white worm seems to spin for itself a cocoon and pass from that into some other stage. Some of the cocoons have remaining in them a brown shell and we find among the cocoons a brown worm also, some of which are inclosed. We think the pest—whatever it is—came to us in a can of corn purchased in the county east of us (Clark), and as yet is confined to the wareroom containing the corn. The white worm seeks hiding places in folds of sacks and crevices of walls, and there makes its cocoon. The first notice of them was a continuous web spread all over the heap of shelled corn with no worms in this web, but bunches of grains webbed together containing cocoons, and on further search we found them as above mentioned. Please tell me what they are, and if liable to become a serious pest, give remedy if you can.—[J. P. Craig, Memphis, Mo., December 18, 1889.

REPLY.—Your letter of December 18 with specimens came safely. The insect which is infesting your mill is a rather serious pest and is known ordinarily as the

Indian-meal moth (*Ephestia interpunctella*). This is the adult of the white worm which spins the cocoon. The brown worm is the larva of a small beetle known as *Attagenus megatoma* and feeds ordinarily upon dead animal matter. It is probably beneficial in your mill rather than injurious. A larva very closely allied to the one which is troubling you has recently appeared in Canada and is the subject of an article in the last number of INSECT LIFE, the periodical bulletin of this Division, a copy of which I send you by accompanying mail. Your insect is referred to on pages 170 and 171. If the insect appears to be confined to your ware room I would advise energetic treatment to rid your establishment of it. The infested corn should be burnt and the entire room should be thoroughly sprayed with benzine or gasoline, the greatest care being taken to avoid fire, as both of these substances are inflammable and the vapor is explosive. Any further details concerning this matter we shall be glad to receive.—[January 9, 1890.]

A Cocoanut Pest to be guarded against.

Small shipments of cocoanuts leaving this port almost continually for the United States, and the possibility existing that some of these cocoanuts are used as seeds, I have, with much interest, watched the scientific observations made at Havana, Baracoa, and here, with the object of discovering the origin of the mysterious disease which is killing many cocoanut palms and at one time almost threatened to annihilate all the plantations producing cocoanuts for market and export. Opinions of scientists have differed as regards the cause and nature of the disease, Professor Ramos, of Havana, ascribing it to a fungus growth on the base of the leaves, which growth penetrates into the crown of the tree, withering and killing it. This theory was proved to be incorrect, and it is now definitely ascertained that the destroyer of the cocoanut tree is an insect of diminutive size, barely visible to the naked eye, the *Coccus* (*Diaspis*) *vandalicus* Galvez. Professor Gundlach, of Havana, at present here, recommends that all cocoanuts as soon as received in the United States be dipped into boiling water and that the bags they are shipped in be destroyed.—[Otto E. Reimer, Consul, United States Consulate, Santiago de Cuba, December 6, 1889, to Hon. Wm. F. Wharton, Assistant Secretary of State, and referred to this Division.

Food of the Scydmænidæ.

Is it commonly known what the food of the Coleopterous family Scydmænidæ consists of? Both Packard in his "Guide," and LeBaron in his Fourth Ill. Report, are silent on this subject. A few weeks ago I found quite a series of specimens of a *Scydmænus* near *brevicornis*, and eight or ten of them had each a brown mite in its jaws. I found these specimens clinging to the underside of stones lying on the ground near the edge of a small body of water, the ground being very damp. This would indicate that these insects are predaceous, at least in the adult stage.—[D. W. Coquillett, Los Angeles, Cal., January 1, 1890.

Abundance of Bryobia pratensis.

By to-day's mail I send you a vial containing some small insects which I wish to know how to destroy. I first noticed them three years ago last fall, when they were found on windows on the east and south sides of the house. They remained all winter and until May, I think. After that time no signs of them were seen. We thought they had gone for good, but in the fall they came again and remained all winter as before. They are here to-day. They come in at the doors and windows and get on the furniture. I have tried almost everything to drive them away, viz: Carbolic acid, corrosive sublimate dissolved in benzine, insect powder, tobacco, salt, gasoline coal-oil, onion juice. Oil or grease will kill them if it gets on them, but nothing will keep them away that I have tried. They are hatching now. In the vial you

will find some of full size, and also some small ones. I wish to know what they are, where they came from, and what they live on. I may add that in the spring the grass is nearly covered with them close to the house. Are they an insect that will disappear bye and bye and stay away? Is there anything that will drive them away? We live in a town of some four thousand inhabitants. I saw one of these insects on a house in town this winter. The first part of May last I saw one on a house 35 miles from here.—[L. H. Ellis, Wilmington, Ohio, December 28, 1889.

REPLY.—Your letter of the 28th ult., addressed to the Smithsonian Institution, has been referred to this Division for reply. The creature which you send is a mite known as *Bryobia pratensis*. It feeds through the summer upon clover and grass and in some places has acquired the habit of migrating to houses in the fall. A number of cases similar to yours have come to our attention within the last two or three years. I know of nothing that will prevent them from entering houses, but after they are in I should say that they could be readily killed with any oily substance. Probably the best thing you can do is to spray the room which is infested with benzine from an atomizer, taking great care with this substance on account of its extreme inflammability. This substance is recommended not only from its insecticide qualities, but on account of the fact that it will evaporate readily and a thorough airing will destroy the odor. It may be well also in the fall, just before the mites begin to appear in the house, to spray the margins of the windows and doors with kerosene, or the grass in the immediate neighborhood of the house may be sprayed.—[January 21, 1890.]

Larval Habits of Xyleborus dispar.

During last autumn the *Xyleborus dispar* appeared very injuriously at Toddington, but since then, to my great regret, I find it has been ravaging unchecked at two or three other localities for a few years—but my present point is the (conjectural) food of the larvæ.

So far as I see I quite agree with Schmidberger that the larvæ feed in the large mother galleries, because in all the specimens I have dissected there are no side galleries, also because I find what I conjecture to be the larva of the *X. dispar* present, and because I find beetles fairly cramming up all the passages, some of these not yet fully colored.

But with regard to food, Schmidberger, in his long account given from minute successive daily examinations, notes that he considers that the larvæ feed on a white material prepared by the mother beetle; other observers have considered that the larvæ of one or more species very nearly allied to the *X. dispar* feed on a mold or fungus that grows in the tunnel.

Now, in my own specimens, I found a white growth which greatly resembled Mycelium of fungus in some of the *dispar* tunnels, and on procuring skilled examination (for I am not a fungoloist), to be made both by microscopic and test examination, it appears likely we shall find that the white material is partly Mycelium and partly white animal matter, thus reconciling the varying observations. At present our observations are quite incomplete for want of specimens, but I have written for some, and then we are going into the subject thoroughly. But meanwhile I thought that the observation, though unfinished, and not proved as yet, might be of some interest, or that what you know of the history in this point of our *dispar*, under your synonym of *pyri* (Peck) might throw some light on the habits of our very destructive pest.—[Eleanor A. Ormerod, St. Albans, England, January 6, 1890.

REPLY.—In regard to the paragraph in your letter of the 6th instant, referring to *Xyleborus dispar*, there is no longer any doubt that in a certain class of Scolytides, to which *X. dispar* belongs, there are no larval galleries, and that, therefore, the food of the larvæ necessarily differs from that of those species whose larvæ excavate galleries of their own. Besides *X. pyri*, which is doubtless a synonym, we have quite a number of allied species in North America, some of them still undescribed, which agree in mode of living, but the real food-habits of the larvæ have not yet been investi-

gated here. In 1844 Th. Hartig had already stated that the "Ambrosia" of Schmidberger is nothing but a fungus which he called *Monila candida*, and that this fungus constitutes exclusively the food of the Xyleborus larva. Eichhoff, on the contrary, believes that the exuding sap, and not the fungus, is the food of the larva. If you can prove that the "Ambrosia" consists of Mycelium and animal matter, Schmidberger's explanation would be partially confirmed. Can you not send us authentic specimens of *dispar* in both sexes?—[January 25, 1890.]

Since the above was written Miss Ormerod has kindly sent us British specimens of *Xyleborus dispar*, both males and females, and after a careful comparison with North American specimens of *X. pyri*, the males of which we possess through the kindness of Mr. Fletcher, we can only confirm the opinion expressed by other entomologists that the two are specifically identical. In other words, Peck's "Pear Scolytus," described in 1817, is an imported species, which was brought into this country (probably first to Massachusetts) early in the present or late in the past century. Until quite recently only the female beetle was known in this country,* but Dr. Lintner and Mr. Fletcher finally succeeded in finding the male, which in shape of body and other important characters strikingly differs from the female.

In Europe this beetle is known as one of the few really polyphagous Scolytids, since it not only attacks all sorts of deciduous forest trees, but also most of the cultivated fruit trees and even Conifers (see Eichhoff, Europ. Borkask., p. 269). In North America it has hitherto been observed only in various fruit trees (apple, apricot, plum, pear, according to Harris), but it doubtless also infests forest trees, for little attention is paid by our Coleopterists to the life habits of Scolytids, and there is difficulty in finding *in situ* those species which feed within the trunk.

It may now be considered a settled fact that in this and other Scolytids which enter the solid wood of trees, the galleries with all their ramifications are the work of the female parent-beetle, which deposits her eggs irregularly in these galleries. The larvæ are not lignivorous, but their food consists of the peculiar substance already alluded to above.

Insects from Iowa.

I send you in the same mail with this a few insects which I can not determine from the collections here. If you can, through the columns of INSECT LIFE, give me their names and any further information concerning them, I shall be greatly obliged.

Nos. 1 and 2 were reared in considerable numbers from the plum curculio, *Conotrachelus nenuphar*, No. 1 being far more common. I have no specimens of *Sigalphus curculionis* Riley, but these seem to differ from the description of that species in the number of the joints of the antennæ and in the position of the ocelli, at least.

No. 3 is a parasite upon the plum gouger, *Anthonomus scutellatus*. In every case where the work of this parasite has been noticed the larval gouger had prepared its place of exit from the plum pit. Otherwise the parasite could probably never escape. The specimen that I send was cut from a plum where it had eaten its way to the skin.

No. 4 were reared in large numbers early in the spring from the cocoons of *Orgyia leucostigma*.

No. 4ª are secondary parasites reared from No. 4.

No. 5 were reared from the galls of *Rhodites radicum*.

No. 6. This parasite was quite common here this summer on *Meromyza americana*.

No. 7. Several of these flies have appeared in my breeding cages where cut-worms were being reared.

No. 8. This Tachina fly has been reared this summer from cut-worms and from the stalk-borer, *Gortina nitela*.

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* It is certainly strange that Dr. Harris, who cut quite a number of the beetles from their galleries, never found a male specimen; at least he does not refer to any differences between the specimens found by him.

No. 9. July 5th a cornstalk was noticed to have a number of maggots burrowing down its center. The stalk was brought into the laboratory and twelve of these Dipterons reared from it.

No. 10. A Tineid moth that I have obtained in large numbers from breeding cages containing cut-worms. Can it be that the larvæ of this insect are parasitic upon the cut-worms, or do they live on clover with which the worms are fed ?

No. 11. Gall and moth. A small bush of *Amorpha fruticosa* was noticed early in the spring to have one of these galls at the tip of nearly every twig. These galls were brought into the laboratory and the moths began to issue May 22.

No. 12. Three of these Ægerians were reared from a cluster of woody galls on a small limb of *Quercus rubra*. The galls were of last summer's growth and were gathered early in the spring. Aside from the moths nothing but a number of guest gall-flies, *Inquilinæ*, were reared.

No. 13. Dipterons reared from maggots that were mining the leaves of the common "pig-weed," *Chenopodium album*.

Nos. 14 and 15. Reared abundantly from plum twigs that were covered with Aphides.—[C. P. Gillette, Ames, Iowa, August 28, 1889.

REPLY.—List of species referred to in Mr. Gillette's letter of August 28, 1889:

1 and 2. *Sigalphus curculionis* Fitch.
3. *Sigalphus canadensis* Prov.
4. *Pimpla inquisitor* Say.
4a. *Pteromalid*, probably undescribed.
5. *Orthopelma occidentalis* Ashm.
6. *Cœlinius meromyzæ* Forbes.
7. *Anthrax scrobiculata* (?) Loew.
8. *Tachina* sp.
9. *Chætopsis ænea* Wied.
10. *Gelechia* sp.
11. *Walshia amorphella* Clem. and its gall on *Amorpha fruticosa*.
12. *Ægeria nicotiana* H. Edw.
13. *Anthomyia* near *calopteni*.
14. *Scymnus cervicalis* Muls.
15. *Leucopis* n. sp. (?).

There is an immense amount of descriptive work yet to be done in the Pteromalidæ and the Tachinidæ, so that it is impossible at present to identify the majority of the species in these families. It is not at all probable that the little Gelechia, No. 10, is parasitic on the cut-worms, and Mr. Gillette's later surmise is doubtless the correct one.

A Grasshopper Letter from Utah.

I thought a few lines from the Farmers' and Gardeners' Club, of Nephi City, might be interesting to you. The farmers of this place have suffered considerable loss this year by the ravages of the grasshoppers, which came in untold millions and ate every green thing before them. The whole force of the people had to turn out and do their very best to destroy them. The best mode that we found was to dig trenches about 3 feet deep and 2 feet wide, drive the hoppers in, put some straw on them, and then burn them up. It was supposed by this method that we destroyed not less than ten to twelve bushels each day for four or five days. After that there were enough left to do considerable damage to the remaining crops. Some of our farmers did not get as much seed as they put in the ground; some got about half a crop. Then came the very hot weather. The water in our irrigating ditches was not more than one-half as much as we have had in years past, the cause being very little snow in the mountains. Our main dependence, therefore, for crops, agriculture, and horticulture suffered greatly, excepting in some few cases. I have not seen the like in the last twenty-seven years, and I am sorry to say that the farmers have come out this season at the little end of the horn. I sent a specimen of the "hoppers" to Prof. Lawrence Bruner, of the Nebraska Agricultural Experiment Station, at Lincoln. He wrote me that they were of the kind that would stay by us; as they were not the migratory kind we would have to fight them to death. I think that the farmers must have been somewhat neglectful to give them such a start. The trench that I spoke of extended about two miles and a half, so you can judge of the labor that it took

to accomplish the work. The apple crop was very light in this part; most of the fruit dropped to the ground before half matured, on the average about one-quarter of a crop. Peaches and plums, however, were in abundance and of the best quality. I never saw finer in these valleys. * * * —[James B. Darton, Nephi City, Utah, November 5, 1889.

Another Insect impressed in Paper.

I have received to-day an interesting pressed specimen of a Neuropterous insect with no other statement in reference to it than that it comes from you. Will you please give me some facts in refe ence to the specimen and how it came to be so completely pressed? The explanation of this particular example can not be the same as that given upon page 381 of Vol. I, INSECT LIFE, of a species of *Lithobius* that was sent from the Giles Lithographic and Liberty Printing Company, for that was evidently caught up in the surface substance of the paper while it was being manufactured.—[C. V. Riley, December 16, 1889, to Mr. N. O. Wilhelm, 25 Clinton Place, N. Y.

REPLY.—Your letter of December 16 is at hand. The specimen of a Neuropterous insect in a heavy manila paper is an interesting exhibition of the power of the paper machine in incorporating with the paper pulp, into the paper itself, the body, legs, and all except the parchment-like wings of an insect. The wings are quite free from the paper except at the point of union with its owner in life and are yet pressed to the common level. You see all parts of the insect can readily be seen. I think it was curiosity that led to this creature's untimely death. It was evidently facing the crushing rollers, for you see behind the long, tapering discolored band, evidently from the juices of its body. Not only this, but meeting its death through being curious and the numerous empty egg-shells in the surface of the paper persuade me it was a female.—[N. O. Wilhelm, 25 Clinton Place, New York City, December 20, 1889.

The "Katy-did" Call.

By careful observation of several years I have established the fact that the call of "Katydid" is made by the tree cricket. I have captured a number of specimens, and had witnesses who watched them. While making the sound the wings are held upright at right angles to the body, and the sound is made by moving the edges of the wings laterally. * * *—[LeRoy T. Weeks, Osborne, Kans., November 23, 1889, to Smithsonian Institution.

I have observed for several years that the common call of "Katydid" is made by the tree cricket, and that the so-called Katydid makes a continuous "Z" sound.

I have called the attention of many people to the fact. I have caught specimens and kept them in my room. I have reported to Prof. F. H. Snow, K. S. U., and shall report to-day to Harvard, Yale, and Smithsonian Institution.—* * *—[LeRoy T. Weeks, Osborne, Kans., November 23, 1889, to Dr. C. Hart Merriam.

REPLY.—Your letters of the 23d ultimo, addressed to the Smithsonian Institution and to the Ornithologist of the Department of Agriculture have both been referred to me for reply as to the portion referring to tree crickets. You have made a not unnatural mistake in considering that you have found that the insect which makes the Katydid cry is the tree cricket. You probably have not heard the true Katydid. The insect to which you refer which makes the sound not unlike that of the Katydid is *Œcanthus latipennis* Riley. The notes of the Katydids have been carefully studied by several entomologists, and you will find in my sixth Report on the Insects of Missouri, pages 150 to 169, a full account of my own observations, while I have treated of tree crickets in the fifth report of the same series, page 120, and in the general index to the same in Bulletin 6 of the U. S. Entomological Commission, page 163.—[December 4, 1889.]

Notes of the Season from Mississippi.

The cotton worm (*Aletia argillacea*, Hübn.): This worm made his first appearance on bottom land of large plantations in the latter part of July, but its injury was greatly diminished by the use of Paris green. It never appeared on upland farms till August, and in some localities not until September. The percentage of loss averages from 15 to 30 per cent. The late June planting tends to swell the percentage of injury, which was caused by severe drought during the latter part of April and all of May.

The boll or corn worm (*Heliothis armigera*, Hübn.): This worm did but slight damage to the cotton crop in this locality, but has been quite numerous on young corn plants, eating holes in the blades, during June.

The corn-plant louse (*Aphis maidis*): Observed during the summer in large groups on corn and sorghum plants.

The corn-root worm (*Diabrotica 12-punctata*): The larva of the above injured the stand of corn very seriously during April and May.

The cabbage plusia (*Plusia brassicæ*, Riley): Very numerous and destructive in gardens in this locality.

The cabbage pionea (*Pionea rimosalis*, Guenée): This garden pest has been very damaging to the entire cabbage family, generally feeding on the tender leaves surrounding the heart.

The cabbage-plant louse (*Aphis brassicæ*, Linn): Found on a good many plants of the cabbage family in vast groups.

White ants or wood-lice (*Termes flavipes*, K.): Have noticed these insects destroying collard-stalks and turnip-roots by gradually eating out the interior.

Proconia undata: Captured several specimens feeding on cabbage during June.

The bean cut-worm (*Telesilla cinereola*, Guenée): Feeding on bean-pods, doing considerable damage to the bean crop.

The squash-vine borer (*Melittia ceto*, Westw.): Quite numerous, boring the vines of cucumbers, squashes, and cashaws.

The squash bug (*Anasa tristis*, De Geer): One of the most injurious insects known in this locality to most all cucurbitaceous vines, especially squash and pumpkins.

The squash borer (*Endioptis nitidalis*, Cramer): Have noticed this worm boring holes into squashes, cucumbers, melons, and cashaws, feeding on the fleshy pulp, which generally causes rot and decay.

The granulated cut-worm (Larva of *Agrotis annexa*, Treitshke): This larva has been very destructive to most all garden vegetables, also very damaging to young cotton plants.

The shagreened cut-worm (Larva of *Agrotis malepida*, Guen.): Have captured this larva feeding upon cabbage plants and likewise on young cotton plants.

The May-Beetle (*Lachnosterna hirticula*): This beetle has been quite numerous and damaging to the foliage of several forest trees during the past summer.

The tomato worm (*Sphinx carolina*, Linn): Very common on tomato plants, also found them this season on tobacco and pepper plants.—[G. H. Kent, Roxie, Miss.

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX, WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord Walsingham.

[*Continued from* p. 155.]

Adela flamensella Chamb.

=*lactimaculella* Wlsm.

This species was originally described from a very bad specimen with antennæ and palpi broken off and therefore presumably with the wing more or less worn.

Imperfect specimens of *lactimaculella*, female, in my own collection agree with the description in having no markings, except a minute whitish spot at the beginning of the costal cilia. The saffron head of the female is also characteristic. Good specimens of the male (which has a black head), show three distinct spots, two costal and one intermediate and dorsal.

Adela simpliciella Wlsm.

A unicolorous species allied to *rufimitrella* Scop. and *violella* Tr. It can not be confused with any North American species, being much smaller than *bella* Chamb.

A very small form apparently undistinguishable from this species occurs in Texas.

Adela punctiferella sp. n.

Antennæ, ♀, 13^{mm} long, whitish tinged with fuscous towards the base.
Palpi, roughly clothed, hoary; the naked apical joint slightly tinged with purple above.
Head and face, roughly clothed, hoary.
Thorax, greenish bronze.
Fore-wings, greenish-bronze, with a small indistinct whitish spot at the end of the cell, a little above the middle of the wing; cilia shading from greenish-bronze to greyish at their tips.
Hind-wings, deep violet, with greenish-brown margins; cilia as in the fore-wings.
Underside of both pairs of wings, violet, sprinkled outwardly with greenish-bronzy scales.
Abdomen, fuscous, hoary beneath.
Exp. al., 10^{mm}.
Hab., Los Angeles, Cal.
Type, ♀, *Mus. Wlsm.*

I am indebted to Dr. Riley for the specimen from which this small but distinct species is described.

Adela bellella Wlk.

= *degeerella* Emmons (*nec* L.).

Walker describes this species as closely allied to *degeerella* L. and I mentioned (P. Z. S., 1880, 78) that it differed from that species "only in the richer coloring and in the darker purple hind wings. The longitudinal stripes before and beyond the central band, as well as the margins of the band itself, are very distinct and of a brilliant shot purple-blue, whereas these and the central band itself are paler in the European species."

Specimens received from Japan are apparently undistinguishable from this species as represented by Walker's type in the British Museum, but without a careful study of the numerous degrees of variation in the many allied Asiatic forms, of which I have a large number of specimens, it would be unsafe to attempt to define its geographical range.

Adela singulella Wlsm.

This species differs from *sulzella* Schiff. in its smaller size, narrower fascia, and in having the antennæ of the female similar to those of the male instead of being thickened to the middle. It has a single narrow fascia on a plain bronzy ground.

Adela septentrionella Wlsm.

This species belongs to the group of which the heads of the male are black and of the female yellowish. It has much the appearance of *trigrapha* Z., in the male sex only, but is smaller, and possesses no third transverse fascia, this being indicated only by a costal spot; moreover the eyes of the male are set much wider apart than in *trigrapha*, and in this respect approaches the genus *Nemotois* Hb. It may be desirable to recognize this genus as occurring in North America, but I prefer to leave this point until the publication of a finally revised index.

Adela purpurea Wlk.

=*biviella* Z.

This very distinct species with its broad post-median white fascia on a bronzy ground, followed by a less conspicuous ante-apical transverse streak, appears to occur only in the northernmost parts of the United States. It is abundantly distinct from all other species.

Adela ridingsella Clem.

= *Dicte corruscifasciella* Chamb.
= *Adela schlœgeri* Z.

This species is quite distinct from all European forms, from which the group of black scales and metallic spots at the anal angle at once separate it. It has much the coloration of a *Glyphipteryx*.

Adela bella Chamb.

= *chalybeis* Z.
= *iochroa* Z.

The original description of *bella* Chamb. refers to a "dull brown purple, violaceous, or golden," species (not green) with indistinct *dark-margined* fasciæ near the apex. The antennæ of the female are described as having the basal half dark purple, but it is not recorded that they are thickened at the base with long scales. This agrees in the main with Zeller's description of *chalybeis*, of which the antennæ are four times the length of the body. Zeller's type of *iochroa* in Dr. Staudinger's collection agrees with specimens in my own collection which are not green, but purplish, and have antennæ of the length described. I can find no difference between this and the description of *chalybeis* sufficient to separate them. In my own collection are specimens of a brilliant green *Adela*, from Louisiana, with thickened antennæ in the female and with indistinct transverse lines (scarcely fasciæ), such as described by Chambers in his second notice of *bella* (Can. Ent., IX, 207, and XI, 125), where I think he may have had this undescribed species before him and not *bella*. It seems to require a detailed description and a name.

Adela æruginosella sp. n.

Antennæ, male, with the basal third tinged with purplish-fuscous, the apical two-thirds white, length 22^{mm}, the basal joint enlarged; female, 10–11^{mm} in length, with the basal half thickly clothed with deep purple scales.

Palpi, ferruginous, much mottled with fuscous.

Head, male and female, covered with long ferruginous scales; face purplish-fuscous.

Fore-wings, shining metallic green, deep purplish towards the apex, with a golden tinge along the base of the greenish-purple cilia; on the purple apical portion of the wing are some ill-defined transverse streaks of metallic green, corresponding with the main color of the wing, not dark-margined nor strictly fasciaform.

Hind-wings, deep greenish-purple; cilia tipped with purple, but slightly tinged with golden along their base, especially about their apex.
Thorax and abdomen, dull greenish-fuscous.
Posterior legs, fuscous; tarsal joints with four white spots on the upper side.
Exp. al., 15^{mm}.
Hab., Louisiana (Morrison).
Types, ♂ ♀, *Mus. Wlsm.*

This species differs from *Adela bella* Chamb. and its synonyms in the decidedly green color of the fore-wings, in the absence of golden scales on the apical surface, and in the absence of transverse fasciaform markings on the apical third of the wing, also in the longer antennæ, of which a larger portion towards the base is tinged with purple.

(*To be continued.*)

GENERAL NOTES.

THE WHEAT SAW-FLY.

Mr. W. Hague Harrington, in the February, 1890, number of the Canadian Entomologist, records the collecting of *Cephus pygmæus*, known in England as the "Corn Saw-fly," by sweeping in a meadow, presumably near Ottawa, and also in a collection received from Mr. Van Duzee, collected near Buffalo, N. Y., on the 9th and 11th of June, 1888. Mr. Harrington's specimens were taken in 1887.

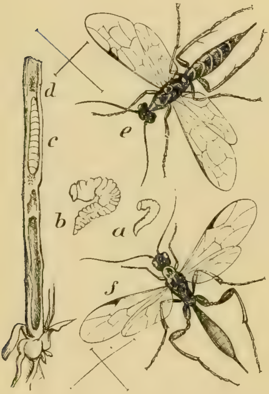


FIG. 60. *Cephus pygmæus*: *a*, outline of larva—nat. size; *b*, larva enlarged; *c*, larva in wheat stalk—nat. size; *d*, frass; *e*, adult female; *f*, female parasite—enlarged (after Curtis).

In this note Mr. Harrington does not refer to Professor Comstock's rearing of this insect from wheat stalks in Ithaca, N. Y., in 1888–'89, which we have noted in a recent number of INSECT LIFE. The figure which we give here is taken from Curtis, and was originally made to show the similarity with the method of work and appearance of *Phylloecus integer*, which bores in the young shoots of willow, and which we treated in No. 1 of Vol. I of INSECT LIFE. A comparison of this figure with the one there given will show the resemblance, and the republication of this figure of *Cephus* will perhaps assist other collectors in recognizing it. The insect figured at *f* is the commonest European parasite—*Pachymerus calcitrator*.

TASMANIAN LADYBIRDS AND THE "AMERICAN BLIGHT."

In reviewing my notes on Australian and Tasmanian insects, published in Vol. I, No. 12, of INSECT LIFE, Mr. Fraser S. Crawford, in The Garden and Field for September, takes exceptions to my statement that the same coccinellid which is so efficient in destroying *Schizoneura lanigera* about Adelaide, South Australia, was found destroying *Rhopalosiphum* on carrot in Tasmania.

When Mr. Koebele and myself parted company in Melbourne, he to go to New Zealand and I to Tasmania, and later to South Australia to secure a supply of the *Schizoneura*-eating coccinellid, I received no description or specimen of the object of my journey to Adelaide, Mr. Koebele stating that Mr. Crawford and myself would have no difficulty in recognizing it.

Of the fruitless search at Heathpool, both Mr. Crawford and myself have written. After rejoining Mr. Koebele at Auckland, New Zealand, on our homeward voyage, and while comparing notes on steamer, I understood Mr. Koebele to say that my Tasmanian species, specimens of which I gave him, was the same as the one I sought to secure at Heathpool. On returning home and preparing the notes for INSECT LIFE, relying on my understanding of Mr. Koebele's statement, I wrote as I did, and not knowing the name of the species, left it blank in the manuscript, and it was supplied in the office of the Division at Washington.

On receipt of the September number of Garden and Field I took pains to have my specimens again determined by the same authority and the species was again pronounced *Leis conformis* Mulsant. The second lady beetle, mentioned as feeding on *Rhopalosiphum*, infesting carrot in Mr. Keen's garden in Kingston, Tasmania, is *Coccinella repanda* Thunberg. Now, Kingston is a small hamlet, surrounded almost entirely by woods and hills, and Mr. Keen's garden is on the outskirts of the village and contains fruits of different kinds, including apples as well as vegetables.

On thinking the matter over again, I remember that the *C. repanda* were much more numerous on the infested carrot tops than *L. conformis*, yet there were a few of the latter present. *Leis conformis* was also very abundant about young bushes of some species of Eucalyptus, infested by *Eriococcus eucalypti* Cr. and, after reading Mr. Crawford's notice, I have no doubt but that they were feeding upon this coccid and some of them had strayed away to Mr. Keen's garden. In reply to Mr. Crawford's objection to the use of the term "little," as applied to *Leis conformis*, I would state that my specimens are from 5^{mm} to 6^{mm} in length. It would not be at all surprising that they were much larger than this in South Australia.

In Tasmania a large number of the pupæ were observed to have been parasitized, and I succeeded in rearing a number of minute Hymenopters from them, but on submitting these to Mr. Howard they were found to be secondary parasites.—[F. M. Webster.

FLIES ON APPLE TWIGS IN NEW ZEALAND.

The New Zealand Farmer for December, 1889, and January, 1890, has contained two articles entitled "Flies on Apple Twigs," which are rather interesting. In the first article an account is given of the occurrence of certain rather large hump-backed flies found sticking upon apple twigs which had apparently "died black" and were covered with a fungus growth. In the second article, however, the fly is determined by Professor Kirk as *Henops brunneus*, and an article is quoted from Mr. Maskell, which states that the black fungus look on the twigs is in reality a mass of eggs laid by the flies. Mr. Maskell saved the eggs until the larva had hatched, but he was unable to keep them alive. He states that the larvæ of none of the *Acroceridæ*, to which this fly belongs, are known, and he is unable to state what these larvæ would have been in the state of nature.

The notes are of considerable interest, especially if the determination should be correct, for upon looking the matter up we find that all of the flies of this family of which the habits are known are parasitic upon spiders. *Acrocera sanguinea* and *A. trigramma* have been reared by C. Koch from the orange-yellow cocoons of *Tegenaria agilis*. *Henops marginatus* or *Ogcodes pallipes* was reared by Menge from *Clubiona putris*, the larva living in the abdomen of the spider. *Astomella lindenii* was reared by Erber, from the abdomen of *Cteniza ariana*. The probabilties are that the discrepancy between the two accounts arises from the wrong determination of the New Zealand insect. The figures are too poor to enable a determination.

NOMENCLATURE OF BLISTER BEETLES.

At the meeting of the French Entomological Society held on November 13, 1889 (*Bull. des Seances*, pp. CCXII–CCXIII), Dr. H. Beauregard proposed some changes in the nomenclature of certain species of Meloidæ, on account of duplicated names. The following apply to our North American fauna:

Nemognatha bicolor Walk. is changed to *N. walkeri*. This change is superfluous as Walker's species has long been known to be a synonym of *N. apicalis* Lec.

Cantharis lugubris Ulke is changed to *C. ulkei* because the specific name conflicts with *Epicauta lugubris* Klug. This change would seem to be unnecessary so long as the genera *Epicauta* and *Cantharis* can be kept apart.

To *Tetraonyx* 4-*maculatus* Fabr. belong as synonyms *T. cruciatus* Cast., described from S. Domingo, and *T. cubensis* Chevr., described from Cuba.—[E. A. Schwarz.

PLANT IMPORTATION INTO ITALY.

We have previously referred in the Bulletins of this Division to the antiphylloxera laws passed at the convention of Berne, and have printed the regulations covering the importation of plants from America into countries represented in the treaty. But as this was some time ago we take occasion to print a letter received by the Italian Minister at Washington from the Italian Department of State, which has reached the Secretary of Agriculture through the Italian Legation in Washington and the Honorable Secretary of State:

ROME, *December* 4, 1889.

Mr. MINISTER: It has happened that certain Royal consular officers in countries which, like the United States of America, do not belong to the International Antiphylloxeric Union, have issued certificates attesting the freedom from phylloxera of plants sent to Italy, or merely the immunity of the countries from which the plants are sent. Now it is well to observe that no plants can be imported from countries that have not adhered to the Antiphylloxeric Convention held at Berne, unless by special previous authorization from the Royal Ministry of Agriculture and Commerce.

Such authorization, in case it is granted, is always dependent upon the presentation of the same documents that are required for plants that are sent from one to another signatory State of the Swiss Convention, and this is because it is expressly provided that States which did not sign that convention can not be treated more favorably than those which did sign it or have subsequently adhered to it.

At the request of the Royal Ministry of Agriculture and Commerce, I inform you of the foregoing, requesting you to give due notice thereof, and to cause such notice to be given to all whom it may concern in the United States, in order that plants sent from that country to Italy may not be refused admission on the Italian frontier.

I will add that, in addition to the aforesaid authorization, the certificate that must accompany shipments of plants must be issued by the local authorities and contain the following declarations:

(1) That the plants shipped are from earth that is at least twenty meters distant from any vine, or that it is separated from any vine by some other obstacle that is deemed sufficient to prevent the extension of the roots of such vine.

(2) That such earth does not contain any vine.

(3) That no vines have been deposited there.

DAMIANI,
Assistant Secretary of State.

The ROYAL LEGATION OF ITALY,
Washington.

TRAPS FOR THE WINTER MOTH USELESS.

Mr. R. McLachlan, in a recent number of the Gardener's Chronicle (Vol. 7, p. 23), calls attention to the fact that the traps which aim at the destruction of the males of the Winter Moth (*Cheimatobia brumata*) will fail of good results, since enough will always escape to fertilize the wingless females, and that it is the latter, rather than the males, that should be guarded against. In this connection is noted the "parthenogenesis" or "agamogenesis" of certain of the wingless female moths, which, of course, would render futile the destruction of the males alone.

A NEW ELM INSECT.

In Garden and Forest for January 15, 1890, p. 30, Prof. J. B. Smith calls attention to a new elm insect (*Zeuzera pyrina* Fabr.) evidently imported from Europe, the moths of which for some time past have occurred in increasing numbers every year in the city of Newark, N. J., particularly about electric lights in the neighborhood of elm trees. Examination failed to show any of the larvæ in the trunks or roots of the elm trees. Recently, however, numbers of the larvæ were found in the small twigs of a felled tree and the pupæ in burrows in the larger branches. The terminal twigs of many of the trees at Newark are reported to be dying as a result, it is supposed, of the attacks of this insect. Recognizable figures of the moths and larvæ are reproduced from drawings by Mr. John Angelmann. The adult insect is a large white moth with blue-black spots, known to English collectors as the leopard moth.

SOOT AS A REMEDY FOR WOOLY APPLE-LOUSE.

The New Zealand Farmer for December, 1889, p. 524, refers to the use of coal soot to destroy the root form of the "American blight" (*Schizoneura lanigera*). The soot is buried 6 or 7 inches below the surface of the affected tree and is said to give very satisfactory results. The use of soot is in the same line as the old remedy of wood ashes which will be found to be equally satisfactory. The alleged efficacy of the soot against all other insect pests of the apple is as is pointed out more than doubtful.

METAMORPHOSES OF FLEAS.

Mr. W. J. Simmons read before the Microscopical Society of Calcutta, March 5, 1888, an interesting paper on "The Metamorphoses of the Dog-flea," which has since appeared in the American Monthly Microscopical Journal, vol. 9, pp. 227–230. He presents some novel phases of flea life, well calculated to excite one's interest in these quite generally anathematized insects. It is stated that there are twenty-five different species of fleas; the dog, cat, fowl, marten, rat, squirrel, hedgehog, mole, pigeon and bat each having its own species, while it is a curious fact that there are also vegetarian species, two of which are mentioned. One of these latter lives in brushwood, while the other is a lover of mushrooms. Besides these, the flea which attacks man has not been mentioned, to which must be added the jigger of tropical America, this being also a true flea. Mr. Simmons makes a considerable point of the order of length of the tarsal joints in the classification of fleas.

Following his notes on the transformations of the dog-flea we find: Eggs were deposited early in the morning of October 17, 1886. These were put in a glass and covered with a pane of the same material. On the morning of October 19, about fifty hours after deposition, most of the nits had hatched out, but a few took twenty-four hours or so longer.

The majority, therefore, required only a little more than two days as their period of incubation. The larvæ were white, eyeless, cylindrical, active grubs; their bodies, exclusive of the head, with thirteen segments. These segments are beset with long hairs, the terminal segment ending in two curved spines, which probably aid the larva in locomotion. They were supplied with no food except blood-pellets (the supposed excreta of the adult flea) that had been left with the nits, etc., on a cloth by a sleeping dog. They were suspected, however, of cannibalism, as their numbers thinned with no other apparent cause. On October 25, the seventh day after leaving the egg-cases, the surviving individuals were found curling up and otherwise acting as though about to pupate. Upon noticing this they were supplied with a fragment of "puttoo," into which, though eyeless, the larvæ quickly swarmed, and there spun little white silken cocoons. November 2, most of them quitted their cocoons as perfect active fleas. They were, therefore, in the eggs for something over two days, as larvæ for six days, and pupæ for eight days, attaining their adult state on the seventeenth day after the deposition of the eggs. This is a much shorter period than given by older writers—Westwood, followed by Packard—who affirm that fleas are larvæ for twelve and pupæ for eleven to sixteen days. However, this may in part be due to the warmer climate of India, where the observations just detailed were made.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

January 9, 1890.—The annual meeting of the Society was held and the following officers were elected for the ensuing year:

President, George Marx; Vice-Presidents, C. V. Riley and L. O. Howard; Recording Secretary, C. L. Marlatt; Corresponding Secretary, Tyler Townsend; Treasurer, B. P. Mann; Executive Committee, E. A. Schwarz, Otto Heidemann, W. H. Fox.

Mr. W. H. Wenzel, of Philadelphia, was elected a corresponding member.

The retiring president, Mr. E. A. Schwarz, then delivered an address upon "North American entomological publications," after which remarks were made upon the address by Messrs. Howard, Riley and Smith.

Mr. Riley expressed the opinion that the recognition of scientific matter, whether descriptive or otherwise, in weekly or monthly periodicals would always depend upon the character of the author of the work and of the periodical; that synonymy should not be affected by the publication of descriptions in newspapers or periodicals which did not have a natural history character, or which did not maintain a regular natural history department.

Mr. J. B. Smith was of the opinion that publications to be recognized in literature should be in accessible journals, or in other words, in works which were put on sale, so that copies could be obtained without favor.

The thanks of the Society were voted to Mr. Schwarz for his address.

B. PICKMAN MANN,
Acting Recording Secretary.

February 6, 1890.—Mr. Schwarz presented a list of the blind or nearly eyeless Coleoptera, hitherto found in the United States, exhibiting in that connection a very full collection of the blind species. The list of the cave-inhabiting species is the same as

published by Dr. Packard; but in that of the non-cavernicolous species, several additions are made and their geographical distribution given. As a preface Mr. Schwarz made some general remarks on blind insects and more especially on their mode of living.

In the remarks on this paper by Messrs. Riley, Howard, and Schwarz, eyeless insects of various orders were discussed, together with the presence or absence of eyes in the different stages of particular insects.

Mr. Riley made some remarks on the larva of Platypsyllus. The discrepancy in size between the larva hitherto described and the mature insect had led him to suspect that the last larval stage as well as the pupa remained to be discovered.

A specimen recently received by him and desciibed and figured (*Entomologica Americana* for February 1890, pp. 27–30) as the "Ultimate Larva," is in general appearance strikingly Mallophagous and a few points may be mentioned as not sufficiently emphasized in the published description. The arrangement of setous hairs on the venter recalled that in the adult, while the raised dorsal points, though unarmed, foreshadowed somewhat the setous points on the dorsal abdominal joints of the adult. Remnants of the anal cerci of the earlier larval stages are noticeable in the two slight swellings on penultimate joint, each surrounded by a series of short spinous hairs. The spiracles are small and lateral, but may be detected with difficulty at the inner angle in the notch between the abdominal joints. The prothoracic spiracle has not been detected.

He had, in the paper already alluded to, raised a parenthetical question as to this being the final form of the Platypsyllus larva, but the position and character of the mouth parts, and particularly the single-jointed tarsi exclude it from the Mallophaga, while its general characteristics, though departing in so many respects from the earlier larva, have caused him to refer it to Platypsyllus. The principal feature that would shake one's faith in this reference is the presence of ocelli, since none occur in the earlier larva nor in the imago, and while such a feature is abnormal under the circumstances, it is no more so than many of the other features of Platypsyllus.

In the discussion, Mr. Schwarz held that if not the ultimate larva of Platypsyllus, it is certainly Coleopterous and can not be referred to the Mallophaga.

In the Coleoptera, the Staphylinid genus *Amblyopinus* is known to be parasitic oı terrestrial rodents, two species having been found in the fur of mice and rats in South America and Tasmania. We might reasonably expect to find this genus in North America under similar circumstances, but a glance at Prof. Riley's larva shows that it cannot possibly belong to *Amblyopinus* nor to any other genus of Staphylinidæ.

Dr. Marx discussed a new family of spiders, the species of which are found abundantly in the spring. These spiders come near the family *Dictynidæ*, and belong to the genera *Neophanes* and *Prodalia*. Dr. Marx mentioned also a new remarkable spider, peculiar among other things in having but two spinnerets—a feature which occurs in but three other known genera. These genera differ from all other spiders, and are only related to each other in the number of spinnerets.

Considerable discussion followed relating to the advisability of erecting new families for odd species. The conclusion reached was that generally it would be better to give such species sub-family importance in the nearest related existing family.

Mr. Linell gave some personal observations showing that *Megapenthes limbalis* Hbst. and *M. granulosus* Melsh. were the same species. He had found these two beetles *in coitu*, and as only males of *limbalis* and females of *granulosus* had been previously known, the identity of the two species was fully shown. *M. limbalis* being first described, holds.

C. L. Marlatt,
Recording Secretary.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. APRIL, 1890.

Vol. II. No. 10.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE.

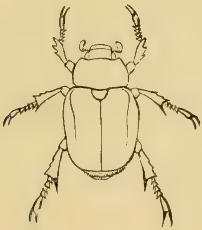
EDITED BY

C. V. RILEY, Entomologist,

AND

L. O. HOWARD, First Assistant,

WITH THE ASSISTANCE OF OTHER MEMBERS OF THE DIVISIONAL FORCE.



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II

SPECIAL NOTES.

On the compound Eyes of Arthropods.—Studies from the Biological Laboratory of Johns Hopkins University, Vol. IV, No. 6, contains a paper "On the Morphology of the Compound Eyes of Arthropods" by Mr. Sho Watase, which is of interest owing to its bearing on the origin of the compound eyes of insects.

The principal subject of the paper is the eye of *Limulus*, but types of the three great groups of Arthropods—Insects, Crustacea, and Arachnids—were studied, and the results are included in the generalizations at the close of the paper.

The primitive type of the *ommatidium*, or visual unit, is traced into a simple open ectodermic pit from which he believes the compound eyes of Arthropods to have developed by a vegetative repetition of similar structures, not unlike what is supposed to have taken place in the formation of certain compound organs in other animals, such as the kidney in vertebrates, or the respiratory organs in Lamellibranchs.

Taking the number of facets as given by Lubbock, the compound eye of the house-fly (*Musca*) would represent about 4,000 invaginations of the skin, and of the dragon-fly (*Æschna*) about 20,000, while an ocellus would represent a single pit.

In an appendix the compound eye of the star-fish is briefly considered and is found to be morphologically strikingly similar to that of an Arthropod. Six lithographic plates accompany the paper and admirably illustrate the author's studies.

More Ohio Notes.—"A Season's Work among the Enemies of the Horticulturist," is the title of a paper by Clarence M. Weed, read December 11, 1889, before the Ohio State Horticultural Society and recently issued in pamphlet form by the author. It treats of both insect and fungus pests and urges the advantage of combining insecticide and fungicide preparations for the simultaneous treatment of both pests whenever possible. The entomological portion of the paper comprises matter for the most part previously published in the bulletins of the Ohio Experi-

ment Station and includes brief accounts of the Striped Cucumber-beetle, the Cherry Tree-slug, a new Strawberry-root Plant-louse (*Aphis forbesi*), described in the August–December, 1889, No. of *Psyche*, and of the "Rhubarb Snout-beetle" (*Lixus concavus*), whose habits are stated (and also in Bulletin Ohio Agricultural Experiment Station, Vol. II, No. 1, second series, No. 8, p. 153), to be for the first time recorded.

In 1872 we studied the habits and reared from the larva found in the stems of *Chenopodium hybridum*, the western representative of this species, *Lixus macer*, while Mr. Webster bred it later from the stems of Helianthus. We briefly recorded these habits and the gall-making habit of *Lixus parcus* from California at the December, 1885, meeting of the Washington Entomological Society (Proc. Ent. Soc. Wash., I, No. 2, 1888, p. 33). That *L. concavus* injures rhubarb in other parts of the country as it does in Ohio and Michigan, was recorded many years ago by Glover, and has been independently observed by Mr. J. G. Barlow and Mr. Wm. B. Alwood. We hope soon to bring our notes on the subject together.

Aquatic Insects of the Mississippi Bottoms.—We have recently received from Prof. S. A. Forbes, Director of the Illinois State Laboratory of Natural History, a paper by H. Garman, entitled "A Preliminary Report on the Animals of the Waters of the Mississippi Bottoms, near Quincy, Illinois."

The report is based on studies and collections made in the summer of 1888, by the State Laboratory of Natural History, the work being aided and facilitated by the Illinois Fish Commission.

After a general description of the peculiar character of the streams and lakes in the locality covered by the investigation, there follows a discussion of the genera and species of the animal life studied, including both the higher forms—mammals, birds, fishes, etc.—and the invertebrates. Among the latter, the Insecta are chiefly considered, and this portion of the work will be of most interest to readers of INSECT LIFE.

The aquatic insects are studied particularly in their relation to fish culture, and those species which are especially important in this connection are chiefly dwelt upon.

Considerable additions are made to our knowledge of food habits in certain cases, and references are given to the published descriptions and accounts of many of the species. Data of importance to the practical ichthyologist are thus brought together.

Insects belonging to the following orders are considered: Diptera, Coleoptera, Trichoptera, Neuroptera, Hemiptera, Ephemeridæ, Plecoptera and Odonata. A single Arachnid is given as occurring near or in the water (*Tetragnatha grallator* Hentz.), and a pale water mite (*Arrenurus* sp.), was frequently taken on the lakes and is believed to be a river species.

Life-histories of some Kansas Moths.—Transactions of the Kansas Academy of Science, Vol. XI, 1887–'88, which we have recently received, contains a paper by Mr. C. L. Marlatt, entitled "Notes on the early stages of three Moths." The species discussed are *Nerica bidentata* Walker, *Anisota stigma* Fabr., and *Callimorpha suffusa* Smith. The life-histories of these moths are quite fully given, together with illustrations of the several stages of each. The species first mentioned breeds on the Elm, the second, as is well known, on the Oak, and the last on Ash.

International Meetings to consider Viticulture and Fungus Diseases.—An International Exposition of apparatus and products for the treatment against mildew, was held at Rome, from the 23d to the 27th of March, 1890, under the auspices of the Italian Œnophile Club. At the same time an International Viticultural Reunion was held, at which various subjects relating to fungus diseases of the vine, investigations on and remedies for the same, were discussed.

THE ROSE CHAFER.

(*Macrodactylus subspinosus*, Fabr.)

By C. V. Riley.

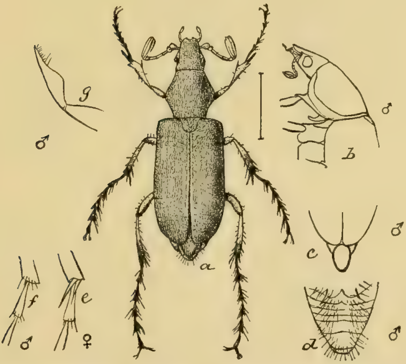

Fig. 61.—*Macrodactylus subspinosus:* *a*, female; *b*, anterior part of male to show the prosternal metacoxal process; *c*, pygidium of male; *d*, abdomen of male; *e*, tip of hind tibia of female; *f*, ditto of male; *g*, front tibia of male—all enlarged (original).

PAST HISTORY.

Few insects are more often referred to in our horticultural literature than this. The accounts have almost invariably referred to the ravages of the mature beetle, and few persons are familiar with the species

in its larval state. In fact, a full life-history with a description of the larva is yet needed, and as we reared it to the imago and made a study of it in the field in 1882 and 1883, and as the beetle attracted more than usual attention the past year we have deemed it advisable at this time to publish the following account.

A native North American insect, there is every reason to believe that this Rose chafer, or Rose bug, as it is more generally called, has increased in number with the progress of horticulture, for the perfect beetle evidently shows a preference for the blossoms and sweeter and more tender fruit of our cultivated plants as compared with those of wild plants. Another reason may be found in the increased area of pasture and meadow lands which form the natural breeding grounds of the species. The first published account of this insect seems to be that given by Dr. Harris in his "Minutes toward a history of some American species of Melolonthæ particularly injurious to vegetation" (Mass. Agric. Report and Journal, X, 1827, pp. 1–12), reported in N. E. Farmer, 1827 (vol. 6, p. 18, ff.). In this account Dr. Harris says that at the time the bugs were first noticed they were confined to the roses, but within forty years they had prodigiously increased in number and had become very injurious to various plants. From this it would appear that as far back as the last century the insect was known as injurious.

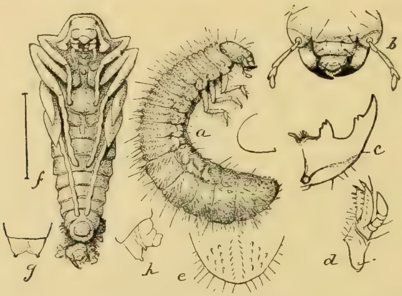

FIG. 62.—*Macrodactylus subspinosus*: *a*, full-grown larva from the side; *b*, head of larva from the front; *c*, left mandible of larva from beneath; *d*, left maxilla of larva from above; *e*, last ventral segment of larva; *f*, pupa from beneath; *g*, tip of last dorsal abdominal segment of pupa; *h*, last segment of pupa from the side—all enlarged (original).

NATURAL HISTORY.

According to Harris the female beetle lays her eggs to the number of about thirty, about the middle of July, at a depth of from 1 to 2 inches beneath the surface of the ground. He does not state the favorite place for oviposition, but in our experience the larvæ are especially abundant in low, open meadow land or in cultivated fields, particularly where the soil is light and sandy. Harris states that the eggs hatch in about twenty days, and, while the period will vary with the tempera-

ture, the larva is found fully grown during the autumn months. With the approach of cold weather it works deeper into the ground, but in the spring will frequently be found near the surface or under stones and other similar objects, where it forms a sort of cell in which to pupate. In confinement the pupa state has lasted from two to four weeks. The perfect beetle issues in the New England States about the second week of June, while in the latitude of Washington it is seen about two weeks earlier. It appears suddenly in great numbers, as has often been observed and commented upon, but this is in conformity with the habits of other Lamellicorn beetles, *e. g.*, our common May-beetles (*Lachnosterna*), and this habit is still more marked in certain species of Hoplia and Serica. It remains active a little over a month, and then soon disappears. The species produces, therefore, but one annual generation, the time of the appearing of the beetle in greatest abundance, being coincident with the flowering of the grape-vine.

GEOGRAPHICAL DISTRIBUTION.

The species is recorded by Dr. Horn (Trans. Amer. Ent. Soc., 1876) as occurring from Virginia to Colorado and northward. It is thus not represented in the extreme South and West of the Rocky Mountains. Northward it extends into Maine, and Canada, and Minnesota. It is certainly absent, or at least very scarce in western Kansas, though common and destructive in the eastern and more wooded portions of the State.

Professor Osborn finds the beetle not particularly destructive in Iowa, and our experience shows that as a rule it is less destructive in the Mississippi Valley than in the East. There are, however, numerous specimens marked "Texas" in the collection of the late Mr. Belfrage. Even in the Eastern States the insect is, in certain more or less restricted areas, rare or absent for reasons which are more or less obscure, but which find readiest explanation in the fact that certain moist and open areas or bottom lands, especially of a sandy character, are the preferred breeding places. Thus Dr. Fitch (2d Rep., p. 247) states that in the vicinity of his residence in New York State he took only occasionally a specimen during twenty-five years, and Dr. Lintner mentions (1st New York Rep., pp. 230, 231) a similar case of local exemption. Harris states that *M. subspinosus*, although common in the vicinity of Boston, is, or was a few years ago, unknown in the northern and western parts of Massachusetts, in New Hampshire, and in Maine. Since the species is now common in parts of New Hampshire and very generally over the whole of the State of Massachusetts, it would appear that the species has of late years extended its range.

In the Gulf States it is replaced by a closely allied species, *M. angustatus* Beauv., which has not yet proved to be injurious and is in all probability less abundant. A third species, *M. uniformis* Horn, occurs

in the extreme southwest of the country and of this we received in July, 1889, specimens from Judge J. F. Wielandy, of Springer, N. Mex., with the statement that they were injuring apples.

FOOD PLANTS AND RAVAGES.

The food of the larva consists of the roots of grasses and probably also of other low plants. Whether it also feeds on the rootlets of trees and shrubs has not been definitely ascertained, although the larvæ have been found quite numerously around the bases of oak trees near Washington, both by Mr. Koebele and Mr. Schwarz. We found them quite numerous in the sandy low lands of the Merrimac Valley, New Hampshire, on cultivated ground, where they must have fed on the roots of various weeds or on those of meadow grass and cultivated rye and maize. It is probable, however, that they occur yet more numerously in unplowed pasture and meadow land than in cultivated fields.

One peculiarity in the food habits of the larva still remains to be mentioned here, viz, that referred to in our report as U. S. Entomologist for the year 1883 (p. 174): While searching for locust eggs in the infested fields at Boscawen, N. H., we repeatedly found the larva of this Macrodactylus feeding on the egg-pods of *Caloptenus atlanis.* This is certainly a remarkable and exceptional food habit in a plant-feeding larva, but it is paralleled in the common White grub (larva of *Lachnosterna fusca*) which we have shown in the first report of the U. S. Entomological Commission (p. 305) to have a similar habit. The habit is doubtless developed only when the locust eggs are thickly laid in the ground.

The beetle has a partiality for flowers, but also feeds upon leaves of various trees and bushes and attacks certain fruits. It has a predilection for the flowers of roses, wild as well as cultivated,* and, in the experience of many observers, prefers white roses to red ones. Another favorite food is the blossom of the grape-vine, with a decided preference for that of the Clinton. This last fact was first pointed out by Walsh in his first report on the Insects of Illinois (p. 24), and has been confirmed by many other observers and by our own observations. Dr. Lintner, in his first New York Entomological Report (p. 229), contradicts this experience, which only goes to show how the habits of the same species will differ in different sections of the country. Flowers of raspberries and blackberries do not escape its ravages. Mr. E. H. Miller states in the American Agriculturist (see Amer. Nat., v. 17, 1883, p. 1291), that the flowers of *Deutzia scabra* are even preferred by the beetle to the grape-vine. The blossoms of the various species of *Spiræa* are often crowded with the beetles and the same may be said of the blossoms of Sumach, the common Ox-eye Daisy, *Magnolia glauca*, Mock Orange, and some other plants. This list could be greatly extended, but we close it with the state-

* The Cinnamon rose, *Rosa cinnamonica*, is said to enjoy immunity.

ment that the beetles also devour the blossoms of *Pyrethrum cinerariæfolium.*

The foliage of most, if not all, of our cultivated fruit trees and especially Apple, Pear, Peach, Cherry, and Plum at times suffer greatly, the two last-named trees being apparently more attractive than the others. The foliage of cultivated grape-vines is almost as eagerly devoured as the blossoms, and the leaves of Oak, Alder, and other forest trees also serve as food. Of low-growing plants the beetles cut the leaves of strawberries, rhubarb, and of nearly all garden vegetables, as also of sweet potato, corn, wheat, grass, and many wild plants.

Not satisfied with this amount of damage, the beetles attack the fruit of peaches, cherries, apples, and grapes when just forming.

Among ornamental plants the Rose is the greatest sufferer. Harris states that the beetle was first noticed on the Rose (hence its popular name), and that it afterward acquired the habit of feeding on grapevines and fruit trees.

In 1887 a statement went through the daily press and agricultural journals (apparently originating in the Philadelphia *Press* from a communication by E. Williams) that the beetle was poisonous. It is said that a lady who smashed some in her hands had these badly swollen up, and further, that chickens fed with the beetles all died. There is, however, nothing to justify the assumption that the beetle is really poisonous, and if the above reports be true, the affliction was no doubt due to mechanical irritation caused by the long and sharp claws and the spines of the beetle.

NATURAL CHECKS.

As with other insects, there are fluctuations in the numerical abundance of the Rose Chafer; but so far as we yet know they seem to be caused by meteorological conditions, for the species has few natural checks, and no true parasites; while but few enemies of its own Class have been observed. Harris says (Treatise, etc., p. 39):

> Our insect-eating birds undoubtedly devour many of these insects. Rose bugs are also eaten greedily by domesticated fowls; and when they become exhausted and fall to the ground, or when they are about to lay their eggs, they are destroyed by moles, insects, and other animals, which lie in wait to seize them. Dr. Green informs me that a species of Dragon-fly, or devil's needle, devours them.

Toads have been observed to swallow the beetles (see *Mirror and Farmer*, v. 35, July 26, 1883), and it may be inferred that the larvæ are eaten by various ground beetles. While at Boscawen, N. H., in the fall of 1882, we found in the ground in company with the Macrodactylus larvæ a number of an undetermined Elaterid larva. Upon placing both kinds in a tin box filled with earth it was found upon our return to Washington that the Elaterid larvæ had killed and devoured most

of those of the Macrodactylus. Since many Elaterid larvæ are either entirely or essentially carnivorous, that observed at Boscawen may thus prove to be one of the natural enemies of the Macrodactylus.

REMEDIES.

It has been assumed by most writers that we can not successfully attack the Rose Chafer in any of its earlier states. To search for the eggs in the ground would be impracticable. It does not, however, follow because of the poor success that has generally resulted from attempts to destroy similar larvæ that they can not be successfully destroyed. In the case of the common European Cock-chafer (larva of *Melolontha vulgaris* and *hippocastani*) and of our own White Grub (*Lachnosterna fusca*) the methods adopted have consisted in plowing and hand-picking. The experiments made, however, on a similar larva with the kerosene-soap emulsion, as narrated in INSECT LIFE (Vol. I, p. 48) clearly show that we have in this insecticide a means of successfully destroying the bulk of the larvæ of the Rose Bug wherever they are known to be sufficiently abundant to justify such treatment. A thorough investigation should be made in the direction of ascertaining the preferred breeding grounds of the species, and it were rash to say here that we have no effectual mode of preventing the insect, nothwithstanding the disfavor in which this mode of warfare has been held in the past.

It is evident, however, that for the present we should concentrate our efforts on the destruction of the beetles especially when they first issue from the ground and congregate in the garden on our roses, grapevines, and fruit trees. A brief statement of the various methods that may be employed for this purpose may prove advantageous. Hand-picking and killing the beetles either by crushing them or throwing them into hot water, or water having a scum of kerosene upon it, has proved useful and satisfactory in a limited way, as also the shaking and knocking down of the beetles into pans or upon sheets saturated or smeared with coal oil. These measures are best carried out and most satisfactorily in the early morning hours and toward evening, as the beetles are then more sluggish and not so quick to take wing as they are during the heat of the day. White roses, Spiræas, or Deutzias, planted on a place, will attract great numbers of the beetles, and thus not only facilitate the destruction of these last, but act as a kind of protection to other plants.

As to other topical applications intended to destroy the beetles, whether directly or by poison taken with the food, the experience with the arsenites is that they are of little avail, and the experience with other materials, like hellebore and pyrethrum, has been so conflicting, that we can not consider either of them reliable or satisfactory. Pyrethrum would seem to have given on the whole the most satisfactory results, and the following experience of Mr. E. S. Carman, editor of the *Rural New Yorker*, would certainly show that it may be used advanta-

geously. It is given in substance from the *Rural New Yorker* of July 7, 1888:

The rose-bugs appeared suddenly on the Rural Grounds in such swarms that their appearance was hardly known until they had half destroyed the grape blossoms. On the morning of the 20th (June, presumably) two hours were spent in spraying rose-bushes, grape-vines, and a *Magnolia macrophylla* about 12 feet high, with Buhach water. The bugs were devouring this latter by hundreds. In fifteen minutes after spraying, thousands of the bugs were found wriggling upon the ground while the tree was virtually cleared of them. Twenty or more of those on the grass were placed in a tomato-can and covered with a gauze so as to confine them without excluding air. These soon became paralyzed, and in the evening were apparently dead.. Those on the grass crawled about in an aimless way. Towards evening some were found apparently dead. The others had disappeared. Here and there a bug was found on the leaves of the tree. The grape-vines and rose-bushes were also nearly free of the pest during the rest of the day. The next day thousands of rose-bugs were again upon the roses and grape-vines, though few could be seen on the magnolia. All were again sprayed with the same effect as that above recorded, and further spraying has not since been deemed necessary.

Col. A. W. Pearson, of New Jersey, states that the "eau celeste" (solution of sulphate of copper with ammonia) is not only the best remedy for mildew, but also at the same time an effective poison to the Macrodactylus.

The trouble with all these remedies is that the beetles during their brief season continue to issue from the ground and to congregate upon their favored plants in such numbers, under favorable circumstances, that however fatal an application may be it has to be continued, and the most persistent may justly become discouraged in a fight with these beetles when they are abnormally abundant and swarm to the extent we have known them.

As early as 1829 Dr. R. Green, as quoted by Harris, urged as a preventive measure the covering of the grape-vines with millinet, but, however valuable such a method may be for choice vines in limited numbers, it would evidently be too costly for large vineyards or for larger fruit-trees.

Another protective measure (first suggested in the *Rural New Yorker* May 19, 1883) is to dust the plants with air-slaked lime or gypsum, and Prof. C. M. Weed has suggested as an improvement upon it (7th Ann. Rept. Ohio Agr. Exp. St., 1888, p. 151) a liberal spraying of lime water, from one-half to one peck of lime to a barrel of water. Mr. E. A. Dunbar, of Ashtabula, Ohio, who tried this "whitewashing" of his grape-vines and peach trees, reports most satisfactory results.

Many other means that have been tried against this pest are not worthy of serious consideration. Such are the spraying of decoctions of various plants with a view of rendering the leaves unpalatable; methods of hastening the blossoming of grape-vines or other plants by artificial means. These and others that have been urged, even where effective, are hardly likely to be generally employed; and in this case, as with many other insects, success will only follow diligence in the

combined application of the insecticides that have been found effective, and the persistent shaking on to sheets or stretchers saturated with coal-oil.

A NEW GENUS AND TWO NEW SPECIES OF AUSTRALIAN LAMELLICORNS.

By Dr. DAVID SHARP, *Wilmington, England.*

The Lamellicorn sent to me by Professor Riley for determination proves to belong to a genus hitherto undefined and is described below, together with another allied species from Adelaide.

Anodontonyx, nov. gen.

Inter genera Haplonycham et Heteronycem locandum. Labium planum. Palpi labiales articulo ultimo dilatato, conico, subtus convexiusculo. Maxillae quinquedentatæ, palpis simplicibus, articulo ultimo quam penultimo duplo longiore. Labrum sat crassum, angulis parum prominulis. Antennæ brevissimæ, 8-articulatæ, clava perbrevi, tri-articulata. Tarsi elongati, unguiculis simplicibus.

The species of this genus will be readily distinguished by the dilatated joint of the labial taken in conjunction with the simple claws of the feet and the remarkably small club of the antennæ. The maxillæ looked at externally appear to be only three-toothed, but there are two other nearly equally large teeth concealed behind the external teeth.

Although allied in many respects to Scitala, I think it would increase the confusion prevalent in collections if Anodontonyx were merged in that genus. Scitala has a longer club to the antennæ, the male feet not elongated, and in most of the species of the genus the labial palpi have a slender terminal joint; the base of the thorax is sinuate on each side and the hind angles are well marked.

Anodontonyx is probably numerous in species in Australia, as I have five or six others belonging to it in my collection, for none of which can I find names. They are all small and quite unattractive insects, and are apparently of retiring habits, as the specimens obtained are very few in number.

Anodontonyx vigilans, n. sp.

Pallide ferrugineus, crebre punctatus; corpore subtus fere nudo, ad latera parce setoso; elytris inter punctaturam lineis elongatis parum conspicuis. Long., 9–10^{mm}.

Head closely and coarsely punctured, clypeal suture very distinct, margin of clypeus strongly reflexed. Thorax short, moderately, coarsely, and closely punctured; hind angles rounded. Scutellum sparingly punctured. Elytra rather sparingly punctured, each with four longitudinal linear smooth spaces extending nearly the whole length, and with a broader space near the suture which, however, is not free from punctures. Pygidium rather coarsely punctate. Prosternum behind the coxæ armed with a prominent acute lamina. Upper spur of hind tibia elongate, as long as the basal joint of the tarsus.

Australia; Koebele.

No sexual differences are to be seen among the six specimens brought to America by Mr. Koebele, and they are probably all females.

Anodontonyx harti, n. sp.

Oblongus, ferrugineus, vel piceus, convexus, crebre fortiter punctatus; pectore utrinque parum hirsuto; elytris ad latera longuis setosis, inter punctaturam lineis elongatis conspicuis. Long., 12–13^{mm}.

Mas: tarsis omnibus elongatis.

This is not very different in color and punctuation from *A. vigilans*, but is distinguished by some important structural characters. The form is more oblong and elongate. The clypeus is rounded in front, and its margin is very strongly elevated. The sides and hind angles of the thorax are much rounded. The pygidium is somewhat obsoletely punctured at the base, smooth towards the apex. There is only a single carina on the prosternum behind the coxæ. The male has the hind tarsi 5½ millimeters long, whereas in the female they are only 3½. In this latter sex the anterior tibiæ are remarkably broad, the three teeth on it also very broad.

This interesting insect was discovered by the late Mr. Hart during his stay at Adelaide in 1886. Although at that locality only for a short time, and when he was in very weak health, he formed a most interesting collection of Coleoptera. The specimens of *A. harti* described above were given to me by his friend, Mr. W. R. Jeffrey, of Ashford, Kent.

AN INTERESTING TINEID.

(*Menesta melanella* n. sp.)

By MARY E. MURTFELDT, *Kirkwood, Mo.*

a b

FIG. 63.—*Menesta melanella: a*, larval mine; *b*, pupa case, with larval mine cut out (original).

The Tineid genus *Menesta*, to which Professor Riley has kindly referred this species for me, was erected by Dr. Clemens for the reception of a particularly aberrant Gelechiid, which he described from a single

captured specimen and named *Menesta tortricella*. The only other species of this genus of which there is any record is a captured unique, obtained by Lord Walsingham from Texas, and described in his lordship's notes on North American *Tineidæ*, in the Proceedings of the London Zoological Society for 1881. This is a small species with dull shaded red fore wings, each of which is ornamented with a minute discoidal ocellus. The hind wings are dark gray.* In all his collecting, personally and by his assistants, Mr. V. T. Chambers, whose studies of American Tineidæ were so extensive, seems never to have met with a species that he could satisfactorily relegate to this genus.

The larval habits of neither of the described species have been observed, but perhaps those of the one which I now propose to characterize may indicate some of their peculiarities.

Menesta melanella n. sp.

Head and thorax above dusky black, face smooth, scales shining-white with golden and iridescent reflections; labial palpi rather short, slender, diverging, slightly curved, second joint scarcely thickened, smooth, tapering to the juncture with the very slender sharply pointed apical joint, inner side white, outer ocherous, dusky at base, maxillary palpi very small, tongue broad, white at base; antennæ brownish-black, with purplish and steely reflections, rough scaled under the lens, but scarcely ciliate, about two-thirds the length of the wings.

Fore wings shining bluish or brownish black, somewhat iridescent, with acute, milk-white, triangular patch on costa midway between base and apex, extending nearly half across the wing, a few white scales near the base; cilia on outer margin pure white, on inner angle dingy black.

Hind wings very dark brown, with rather broad white marginal streak on costal edge, extending from near the base beyond the middle and a patch of white in the cilia near the outer angle, also a few white hairs near the inner angle. Under surface of both fore and hind wings fuscous with leaden reflections, the white costal triangle nearly as well defined beneath as above.

Abdomen above, iridescent, shining black. Thorax beneath and broad ventral abdominal band, white with metallic luster. Front legs white, middle pair white, on femora and tibiæ, with tarsi, dusky, indistinctly annulate with white; hind legs dusky and leaden gray, with broad band of white encircling tibiæ; terminal joint whitish at base, shading to dark gray at tip; upper spurs long, white; lower spurs ocherous. All the white on the under surface has, in certain lights, deep golden and opalescent tints, with a somewhat more stable ocherous shade at the joints. All the legs are coarsely scaled and hairy. The alar expanse is from 10 to 12^{mm}.

This species is pretty and characteristic in its perfect form and interesting in its larval habits and transformations. The larva appears late in summer, on the post oaks (*Q. obtusiloba*) and requires nearly a month to attain maturity. It is at first a miner, but later—probably after first molt—feeds externally on the under surface of the leaf, skeletonizing a large space on one side of the midrib, protecting itself above under a web which is dense in the center and becomes gradually attenuate towards the edges, from under which the frass is ejected. When dis-

* I have since noticed that Lord Walsingham has removed this species from *Menesta* and placed it in the *Tricotaphe* section of *Gelechia*. He also states that it is a synonym of Chambers' *Gelechia refusella*.—M. E. M.

turbed the larva retreats swiftly to the more densely woven part of its cover.

Length of full grown larva from 7 to 8^{mm}, diameter 1.5^{mm}, nearly equal throughout, form depressed, sutures deep, especially laterally; surface smooth; color dingy translucent white, with a broad, smooth pale purple dorsal band extending from the second to the tenth segment. Head small, about one-half the diameter of the first thoracic segment, opaque, yellowish white. Piliferous spots minute, impressed, hairs microscopic. Legs and prolegs yellowish white, almost transparent.

In preparing for its transformations, the larva thickens its tent of white silk, which is externally somewhat disguised by a skillful intermingling of powdery particles of the cuticle of the leaf. It lines the under side also with a mat of silk and then proceeds to cut out a broad oval section around the densest part of the web, about one-half inch in length. This is joined at the edges and forms an *Aspidisca*-like case, which is dragged to some distance from the injured portion of the leaf and firmly attached to the under surface by a broad band of silk from one-eighth to one-fifth of an inch long appearing like a handle to the slightly curled case (Fig. 63*b*). Within this case the larva changes to a somewhat flattened, pale brown pupa, in which state it hibernates.

The imagines usually appear in April, often at long intervals. Of the three specimens bred, one emerged on the 14th of March, one on the 14th of April, and the third on the 24th of the same month. I also captured a single damaged specimen some years ago during the month of May. It is not in this locality at least an abundant species.

EXPERIMENTS WITH THE PLUM CURCULIO.

By F. M. Webster.

These experiments were originally intended as a continuation of those made during 1888 and published in the annual report of the Department for that year, pp. 78, 79. On account of a lack of material, especially of the domestic varieties of plums, the result of previous experiments did not reflect as conclusively upon contested points as desired; and as it would hardly be proper, at the present time, to summarize results based on one set of experiments made during one season, and another the next, under more or less varying conditions, the series this year are also intended to repeat and elaborate some of those made on the wild varieties last season.

The source whence the material was secured is given in the records of each experiment, and I will only add that the larger portion of the first was taken by myself, beneath the trees from which it had fallen, the point being to change the conditions under which it was found only so far as necessary to a change from one locality to another.

The methods employed in carrying on the experiments were the same as last year, except that, in view of the results already obtained, the earth in which the insects had developed was not treated with water, but examined carefully on the dates given, and a record kept of the number of adult beetles found. For vivaria, 8-inch drain tiles, the same as last year, were used.

Experiment No. 1.—June 13, 1889, one hundred and fifty Wild Goose Plums, from Aper's orchard, La Fayette, containing one hundred and eighty-five egg punctures, were placed in vivaria.

Result of examination on September 4: Thirty-eight adults. Dead.

Experiment No. 2.—June 13, fifty Mariana Plums, from Experiment Station orchard, containing eighty-six egg punctures, were placed in vivaria.

Result of examination on September 4: Fourteen adults. Dead.

Experiment No. 3.—June 18, fourteen Kansas Sand Plums, from E. Yenowine, Edwardsville, Ind., containing fourteen egg punctures, placed in vivaria.

Result of examination September 3: Four adults. Dead.

Experiment No. 4.—June 18, six Nectarines, from E. Yenowine, Edwardsville, Ind., containing seven egg punctures, placed in vivaria.

Result of examination September 3: Nothing.

Experiment No. 5.—June 18, twenty-four Chickasaw Plums, from E. Yenowine, Edwardsville, Ind., containing twenty-four egg punctures, placed in vivaria.

Result of examination September 3: Five adults. Dead.

Experiment No. 6.—June 19, two hundred and twenty-five Coe's Golden Drop Plums, from J. G. Kingsbury, Irvington, Ind., containing six hundred and eleven egg punctures, placed in vivaria.

Result of examination September 2: One hundred and nineteen adults. Dead.

Experiment No. 7.—June 19, three hundred and sixty-eight Wild Goose Plums, from orchard of Albertson and Hobbs, Bridgeport, Ind., containing seven hundred egg punctures, placed in vivaria.

Result of examination September 4: One hundred and eighty-one adults. Dead.

Experiment No. 8.—June 19, one hundred and sixty-seven Nectarines, from orchard of Albertson and Hobbs, Bridgeport, Ind., containing five hundred and thirty-three punctures, placed in vivaria.

Result of examination August 28: Fifty-three adults. All living.

Experiment No. 9.—June 20, one hundred and twenty-eight large Damson Plums, from Greencastle, Ind., containing one hundred and thirty-nine egg punctures, placed in vivaria.

Result of examination September 4: Fifty-three adults. Dead.

Experiment No. 10.—June 20, one hundred and sixty-eight Robinson Plums, from Greencastle, Ind., containing two hundred and twenty-three egg punctures, placed in vivaria.

Result of examination September 4: Thirty-five adults. Dead.

Experiment No. 11.—June 20, one hundred and sixty-eight Mariana Plums, from Greencastle, Ind., containing two hundred and nineteen egg punctures, placed in vivaria.

Result of examination September 3: Fifty-three adults. Dead.

Experiment No. 12.—June 20, three hundred and thirteen Lombard Plums, from Greencastle, Ind., containing four hundred and sixty-two egg punctures, placed in vivaria.

Result of examination September 3: Sixty-five adults. Dead.

Experiment No. 13.—June 20, ninety-five Yellow Egg Plums, from Greencastle, Ind., containing one hundred and three egg punctures, placed in vivaria.

Result of examination September 4: Nineteen adults. Dead.*

*Six larvæ from this lot were destroyed.

Experiment No. 14.—June 24, one hundred and seventy-six Wild Plums, from woods in Knox County, Ind., containing two hundred and twenty egg punctures, placed in vivaria.

Result of examination September 4: Thirty-five adults. Dead.

Experiment No. 15.—June 24, fifty-nine Lombard Plums, from Knox County, Ind., containing seventy-nine egg punctures, placed in vivaria.

Result of examination September 4: Fifty-one adults. Mostly dead.

Experiment No. 16.—June 24, one hundred and ninety-one Blue Damsom Plums, from Knox County, Ind., containing two hundred and twenty-six egg punctures, placed in vivaria.

Result of examination September 4: Seventy-six adults. Few alive.

Experiment No. 17.*—June 25, fifty-three Apples, from Princeton, Ind., containing sixty-two egg punctures, placed in vivaria.

Result of examination September 6: Five adults. Living.

Experiment No. 18.*—June 25, fifty-four Apples, from same tree as No. 17, containing sixty egg punctures, placed in vivaria.

Result of examination September 6: Nothing.

Experiment No. 19.*—June 25, twenty-nine Apples, from same orchard as No. 17, containing thirty-six egg punctures, but from another tree, placed in vivaria.

Result of examination September 6: Three adults. All living.

Experiment No. 20.—June 26, forty-seven Nectarines, from same tree as Experiment No. 4, and containing forty-eight egg punctures, placed in vivaria.

Result of examination September 4: Six adults. Living.

Experiment No. 21.—June 26, ninety Blue Damson Plums, from E. Yenowine, Edwardsville, Ind., containing one hundred and twenty-five egg punctures, placed in vivaria.

Result of examination September 4: Ten adults. Dead.

Experiment No. 22.—July 12, twenty large Damson Plums, from isolated tree in garden of Hon. E. H. Scott, La Porte, Ind., containing sixty-five egg punctures, placed in vivaria.†

Result of examination August 13, 14, 16: Twenty adults. All living.

Summary of experiments.

Varieties of fruits.	No. of specimens.	No. of punctures.	Adults reared.	Ratio per specimen.	Ratio per puncture.
Large Damson	148	204	73	2.02	2.79
Blue Damson	281	351	86	3.26	4.08
Yellow Egg	95	103	19	5.00	5.42
Lombard	272	541	116	2.34	4.[illegible]6
Coe's Golden	225	611	119	1.98	5.13
Nectarines	220	588	59	3.72	9.96
Wild Goose	518	885	219	2.36	4.04
Mariana	218	305	67	3.25	4.55
Kansas Sand	14	14	4	3.50	3.50
Chickasaw	24	24	5	4.80	4.80
Wild	176	220	35	5.02	6.27
Robinson	168	223	35	4.80	6.36
Apples	136	158	8	17.00	19.62

As will be observed, the greatest mortality to eggs and larvæ between the time of oviposition and the hatching of the adult occurred in the Wild and Robinson varieties of plums. Also that the apples used this

*A number of plum trees were growing in the immediate vicinity, but I could not get enough fallen plums for experiment.

† The top was so covered with a cone-shaped screen that the adults could be observed as soon as they emerged from the ground.

year were collected on the same day as the latest used last year, and from which nothing was reared. Those used the present year were from a more southern locality, where the season was correspondingly earlier, but the earliest to fall last year were used on experiments of June 20, leaving only the later fallen for the experiment of a few days later, and which gave no adults. Therefore, it would appear that the later punctures either contained fewer eggs, or else a larger portion of the larvæ perished before reaching maturity. If this be true, the variety of plum whose blooming season covers the greatest period of time will best withstand the work of the curculio; the earliest appearing fruit forming a sort of protection for the later.

So far as my experiments have gone the rule seems to hold good among both apples and plums. All of the apples used in both last season's experiments and this were grown among plum trees also fruiting, thereby demonstrating the fact that the planting of plum trees in the apple orchard will not protect the latter and *vice versa.*

From the drift of evidence gained from experiments of both last year and this, it would appear that if anything is to be gained by using another fruit to draw off the curculio and protect the plum, the point is almost as likely to be attained through the Nectarine as the apple. Indeed, this year the apples on the tree from which the fruit for last year's experiment was obtained suffered as bad or worse than the plums on trees growing interjacent. For position of this tree see Diagram.

The apple tree bloomed profusely, and produced a good crop of young apples, but by July 24 there was scarcely a dozen left on the tree, and the condition of these is illustrated by a figure,* drawn from specimens picked on this date, and bearing not only crescent marks in abundance, but also punctures, indicating that the adult beetles had recently been feeding on the pulp.

There seems to be little doubt but that the food punctures were made, in part at least, by the newly emerged adults. I saw an adult puncturing a plum at Greencastle, Ind., on June 22, and Mr. W. O. Fritz, foreman of the experiment farm, on July 23, brought me an adult curculio found that forenoon engaged in the same mischief, and adults were observed in experiment No. 1, July 29, which might have been and doubtless were present some days earlier, as the experiment had not been examined. It seems rather more than probable that the latest appearing individuals of the old brood of beetles may occur simultaneously with the advance individuals of the new brood, both feeding upon the fruit of the plum, apple, etc.

Occasional notices appear in the agricultural papers to the effect that the female curculio will not oviposit in fruit overhanging water. While this seems very doubtful, to say the least, an experiment was made in order to test the matter, but while clearing up the fog in one quarter, the results appear to have still further increased the obscurity in another.

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* This figure will be published in the next number of INSECT LIFE.

A shallow pan, constructed large enough to cover the ground under one-half of a plum tree, of the Mariana variety, was placed in position on April 24, and kept continually filled with water until August 10. Now, not only were females observed in the act of ovipositing in plums hanging directly over the pan, but the latter contained from time to time quite large numbers of punctured fruit; nevertheless, the only plums on the tree reaching maturity were among those hanging directly over the water.

c	c	c	d	d	d	c	c	d	c	c	c
c	d	c	c	c	c	c	c	c	c	c	c
b	b	c	o	c	c	c	c	c	c	c	c
j	c	c	c	c	c	c	c	i	i	i	i
f	d	g	c	g	g	c	j	c	i	i	c
f	b	d	f	f	f	f	c	f	f	f	f
b	a	a	i	a	f	f	f	f	f	f	f
b	a	a	b	a	a	h	a	a	a	b	b
a	a	e	e	e	e	e	e	e	e	e	a
a	a	a	a	a	a	a	a	a	a	a	a
a	a	a	a	a	a	a	a	a	a	a	a
a	a	a	a	a	a	a	a	a	a	a	a
a	a	a	a	a	a	a	a	a	a	a	a

Explanation.—a=Blackman Plum; b=Wild Plum; c=Wild Goose Plum; d=Boggs' Plum; e=Crab Apple; f=Late Cherry; g=May Cherry; o=Seedling Apple; h=Moore's Arctic Plum; i=Quince; j=Pear.

A single experiment was made to determine the duration of life, and the probability of the female ovipositing, after having partaken of poison. Twelve females taken from the plum tree on May 17, where they were evidently ovipositing, were kept for 24 hours without food, some eggs having in the meantime been deposited in the box where they were confined. At 5 p. m. they were removed and placed separ-

ately in receptacles containing a leaf of the plum, thickly dusted with London purple. At 8 p. m., 3 hours later, nearly all seemed to be affected, but were removed and placed separately in clean quarters, and each provided with a fresh plum. At 11 a. m. next day many were dead, the remainder surviving but a few hours longer, but in no case were eggs deposited in the fruit.—[October 1, 1889.]

THE PHYLLOXERA PROBLEM ABROAD AS IT APPEARS TO-DAY.

The report of the Superior Phylloxera Commission has just been published and gives the latest account of Phylloxera matters in France and other foreign countries. Neither law nor effort has prevented the spread of the insect in eleven *arrondissements* in which it made its appearance for the first time the past year, viz: Castellane, Mende, Riom, Joigny, Troyes, Nogent-sur-Seine, Bar-sur-Aube, Vesoul, Gray, Bonneville, and St. Calais. About 240,000 acres have undergone defensive measures, submersion being employed in 72,000, bisulphide of carbon in 145,000, and sulpho-carbonate of potassium in 23,000.

Much good has resulted from the establishment of societies for defense, notably in Haute-Loire. Moreover, it is the small proprietor who derives the largest benefit from the law enacted August 2, 1879. Of twenty-one thousand three hundred and ninety-four proprietors composing a syndicate, each attended to about 4½ acres.

The departments in which vine cultivation is extensive, such as Herault, Gard, and Gironde, contain fewer syndicates for the reason that their Phylloxera work is practically at an end. Each year has shown an increasing acreage of reconstituted vineyards, mostly by means of American stocks, which prove more and more satisfactory and which justify the commission in prophesying the near approach of the time when vine-culture will be as widespread as it was before the era of the Phylloxera. The following approximate tabular statement will be interesting in this connection:

Years.	American vines covered.	Departments.	Years.	American vines covered.	Departments.
	Acres.			*Acres.*	
1881	22, 000	17	1886	276, 900	37
1882	42, 700	22	1887	413, 700	38
1883	70, 000	28	1888	536, 900	43
1884	131, 909	34	1889	719, 500	44
1885	188, 200	34			

If the march of recovery continue at this ratio, in four years vine-planted land in France will reach the unprecedented amount of 6,500,000 acres. Hérault presents 380,000 acres of renewed vineyards; Aude,

68,000; Gard, 60,000; Gironde, 47,000; the western Pyrenees, 75,000; and Var, 47,000.

The efforts to produce by hybridization Phylloxera-proof varieties have so far not proved successful or popular, as most growers still depend on grafting on the American stock. Another noticeable fact is that the Government does not hesitate in its liberal policy of doing all in its power to aid the afflicted vine-grower, and the law of December 1, 1887, by which the land-tax on newly planted or restored vineyards is remitted for four years, is still in force.

Five years ago the Phylloxera first became known in Algeria, and since then it has been kept pretty well in check by the vigorous measures prescribed by the resolution adopted March 21, 1883. The cost has been great, but the results have fully justified the outlay. The vine there covers nearly 250,000 acres, and the vintage of 1889 shows approximately 66,000,000 gallons of wine.

A glance at the viticulture of other vine-growing countries shows that the industry is rapidly developing, especially in Chili, Uruguay, the Argentine Republic, and Australia. The Tunisian vineyards present remarkable developement.

Spain and Italy are yet suffering severely from Phylloxera. In the former the small proprietors are reduced to the necessity of abandoning the cultivation of their fields or selling them at much depreciated prices. The emigration from Malaga to Brazil and the Argentine Republic between April and August, 1889, amounted to eleven thousand persons, and may be taken as an index of the situation.

In Italy about 400,000 acres are affected, and the Government has been forced to forego its first system of defense and resort to American stocks.

Hungary suffers sorely. About one-third of its plantations are attacked and about one-eighth destroyed.

Austria suffers in almost like proportion.

In Switzerland the progress of the Phylloxera has been slow, and in Germany and Russia, owing to the measures taken for its suppression, it makes no progress.

Portugal seems to be in the worst plight of all, for each year the number of invaded districts increases, chiefly in the north, where there are 250,000 acres of infested vines and 90,000 acres of dead ones. The Douro region aggregates 80,000 dead vines out of a possible 125,000.

Nowhere has the combat been carried on more energetically than in France, originally the most sorely stricken country, and nowhere has so much success been achieved against Phylloxera attack.

THE LOS ANGELES COUNTY HORTICULTURAL COMMISSION.

The following copy of the last report of the board of horticultural commissioners of Los Angeles County, Cal,, is taken from the Los Angeles *Evening Express* of March 5, and will not be devoid of interest to our readers. The account of the correspondence between the Secretary and this office is very fair. with the important exception that we insisted upon the necessity of first thoroughly knowing our ground before taking extensive steps for the importation of enemies of the scale insects mentioned. By this we mean ascertaining carefully the range of each species and the probabilities as to its original home.

We respectfully tender herewith the monthly report for February of the county horticultural commission.

The policy adopted by this commission of continued and earnest research for a parasite that will destroy the red and San José scales, or any other pests that are injurious to fruit trees, has been pursued during the past month.

Our secretary was instructed to communicate with United States Entomologist, C. V. Riley, at Washington, requesting him to ask Congress for an appropriation that would enable the Department of Agriculture to seek the world over for parasites that prey on the insect pests that are now threatening the wefare of our great fruit industry. In reply, Professor Riley advises us "that he will not be able to do much with Congress in the way we suggest, but that he hopes and expects that the United States Department of Agriculture will have power to act without such a petition after June next." Professor Riley still further advises us "that the red scale of California (*Aspidiotus aurantii*) has been believed to be of Australian origin, but that it is about as abundant there as it is in California. He says that it does occur in other parts of the world, and much inquiry will have to be made before we can feel sure of its native home; that it has some parasitic enemies in California, and though it doubtless has others in Australia, we know so far only of a fungus and a small beetle that attack it there." Professor Riley also says "that the San José scale (*Aspidiotus perniciosus*) is not as yet known to be an imported species, but that all these scales are amenable to careful treatment by the sprays which we have lately recommended, or by the improved gas treatment."

Notwithstanding the valuable opinion of Professor Riley ,this commission feels that in making inquiry for a parasite for the red scale in other countries search should also be made for an enemy for the San José scale insect. This pest, if not speedily destroyed, will utterly ruin the deciduous fruit interests of this coast. It not only checks the growth of the tree, but it covers the tree literally entirely, and the fruit nearly as much so, and if left unchecked, the tree is killed in three years' time.

There is absolutely no parasite at work on the San José scale insect. We find this dangerous pest invading every deciduous fruit district in the county, and have notified owners of such infested orchards to disinfect, giving them the necessary mode of procedure. Unless the San José insect is thoroughly stamped out the deciduous fruit interests of the county will in a few years have dwindled to naught.

In our January report to you we mentioned having been compelled, after exhausting the necessary preliminaries, to place in the hands of the District Attorney for prosecution the case of F. O. Cass of Vernondale. We were led to take this step, not only from our sense of duty to the State law prescribing it, but as a determination of our duty and obligation to the fruit growers of Los Angeles County, wherein we sought to stamp out a dangerous insect pest, the Santa Ana red scale, just obtaining a foot-hold in this county.

The case came up before Justice Rankin and a jury of six, February 14, in San An-

tonio Township, and was decided against the State on the 17th. The evidence of the defense was simply a line of individual theories, in fact farcical, when compared with the important results of years of study by scientific entomologists and the long and tried experience of the most thorough and intelligent horticulturists of our own county.

It is not and has not been the policy of this commission to enforce indiscriminate spraying without regard to the existence of parisitic insects, but in the case of Mr. Cass it was evident to us that unless prompt measures were taken the Santa Ana red scale would effect a lodgment in this district that would eventuate in its spreading to every citrus fruit orchard in Los Angeles County in another twelve months.

The result of our efforts, when it is considered as the consequence of public opinion, is certainly a sad commentary on Los Angeles County as a citrus or deciduous fruit growing district. This commission endeavors to squelch the most dreaded of all red scale insects in its incipiency, an insect that has no effective parasite, but are prevented from doing so by a jury influenced by the public opinion of Vernon district.

In connection with this deplorable result we hand you herewith a careful compilation of statistics, showing the number of citrus trees now under cultivation in the county. It does not include trees situated in acreage cut up into "town lots," or that have been abandoned or are not worthy of future care.

Description.	Age ten years and over.	Age five years to ten.	Age five years and under.
Number of orange trees	289,677	119,530	187,500
Number of lemon trees	18,055	29,345	10,350
Number of lime trees	4,575	435	150
Number of citron and pomalo trees	15	15	....

In addition to this there are 395,000 budded orange and lemon trees in nursery form that will be planted the coming season. This does not include seed-bed plants.

Thus there will be 1,054,647 citrus fruit trees, the comparative income from which can be easily computed, that will be threatened with ruin by an insect pest that the commission have been opposed in their endeavors to check.

In our previous reports we have called your attention to the quarantine of other counties against our nursery stock and fruit. The wide publicity given this late obstruction to the law, made to protect and promote the horticultural interests of the State, will still further enact against the county.

We are pleased, however, to report that in some portions of the county producers are alive to the value of our fruit industries, and realize the necessity of vigilant protection. In connection therewith we hand you a communication from the Pomona Board of Trade, inclosing resolutions adopted by that body.

Our instructions to inspectors have been to inforce the law in all cases in reference to infected fruit exposed for sale, and since receipt of Pomona Board of Trade resolution we have renewed said instructions.

It will be apparent to you that if the trees under cultivation and to be set out this season are to return an income to our producers, and if Los Angeles County is to retain its well-earned reputation as a citrus-fruit growing county; and still further, if the thousands of acres in this county so well adapted for fruit-growing are to be settled up and cultivated by fruit-growers, it will be necessary to redouble all previous efforts in a warfare against insect pests.

We regret to report that during the past month a new insect pest, that is, new to this county, has found a lodgment here. We refer to the "Purple scale" that has been introduced on the large number of orange trees now being brought into the State from Florida. Effective means are, however, being used by us in stamping it

out, and we are pleased to be able to report that we have been willingly supported in our efforts by all dealers handling the stock.

The State board of horticulture, the State fruit-growers' convention, and the convention of county horticultural commissioners, all meet in Los Angeles March 10 to 15. These bodies will be made up from the leading horticulturists of the State, men of high intelligence and long experience in horticultural pursuits. From their deliberations and determinations we hope for grand results in furthering the fruit industries of our county and in protecting it after such promotion.

We have employed the same number of inspectors this month as during the last. They have inspected 857 acres, containing 49,759 trees, and have served thirty-two notices on owners of infected orchards.

Respectfully,

A. F. KERCHEVAL, President.
F. EDWARD GRAY, Secretary.
County Horticultural Commissioners

EXTRACTS FROM CORRESPONDENCE.

The Pine Lachnus as a Honey-maker.

I send by this mail a box with pine tags, live Aphids, and honey-dew. I put in a section of limb, cut sometime ago, where the insects had sucked the bark dry.

Cutting a limb with the Aphids on, and the leaves covered with honey, I found the next day that they had gone to the cut, where they were fifty deep trying to get at the exuding turpentine. I wish you would send a man, a good chemist and microscopist, to look into this matter. This honey can be seen on the laurel leaves where there are no Aphids. My son, while hunting last week and looking under the pines, noticed that the rays of the sun made visible a fine spray falling from them. Another man told me yesterday he had seen the same. I can show proof that the honey is not a visible exudation from the aphis. I can get you a small vial of this honey gathered drop by drop from the pine leaves. My neighbor has secured 8 small vials full.

We often have honey-dew in summer, sometimes covering the hickory, gum, oak, chestnut, and poplar leaves, but this is the first winter shower of manna we have observed here. It commenced December 20, and ran every day to the 30th; then January 1 to 7, 10, 11, 12, 13, 23, 26, 27, 29 (?), 30 (?), 31; February 1, 3, 4, 12, 13, 15, 16, 17, 18.

My eighteen years' observations have proved to me that the atmosphere is nature's storehouse for honey; my proof and facts I don't think can be overcome. There is so much of this honey on the pines now that my seventy-three colonies of bees can't gather it from them. I estimate 100 pounds of honey on every acre of pines. In the morning it is there like dew in drops as large as peas, but before night it evaporates to thick, ropy honey.—[W. M. Evans, Amherst, Va., February 18, 1890, through the Smithsonian Institution.

REPLY.—The inclosed letter from Mr. W. M. Evans, of Amherst, Va., referring to accession No. 678, is very interesting, and examination of the specimens shows that the plant-louse secreting the honey-dew in such quantities upon the pines is one of the species of the genus *Lachnus* of which several species are known upon coniferous trees. The specimens are dry and can not be determined specifically The facts which Mr. Evans gives us show that the honey-dew is more abundant than I have ever known it before in the Eastern United States, and his letter is well worthy of publication. I shall therefore take the liberty of publishing it in a near number of INSECT LIFE, a copy of which will be sent to him.—[February 21, 1890.]

Root Knot on Apple Trees.

A copy of Bulletin No. 20, Division of Entomology, on the root-knot disease, which was sent to my former address at Glencoe, Nebr., has just reached me. I have been interested in the perusal of Dr. Neal's notes from having had some experience with root-knot myself.

In the spring of the present year I bought several hundred two-year-old trees of willow twig and Ben Davis apple from a local nursery. In planting I found the roots of many were very knotty; those worst affected having few fibrous roots. Not one in ten of some four hundred put out any leaves from the tops, but most of them sent out sprouts from the side of the trunk at or near the ground, which shoots made a weak growth. I had requested the proprietors of the nursery to give me trees of their own raising and supposed they had done as they agreed to do, but some of their employés afterward told me that my trees must have come from Kansas, as they "got all those knotty-rooted trees from that State."

Dr. Neal does not mention apple among the plants affected by Anguillula, and for this reason, and also because he thinks his evidence conclusive that the disease does not exist 150 miles from the coast, I have thought it worth while to bring this matter to your notice. Many of the trees died during the drought of July and August. About seventy-five trees of Ben Davis and Maiden Blush, brought from same nursery same spring, but a few days later, and which had good fibrous roots showing no knots, have grown and done as well as usual in a dry season.—[G. M. Dodge, Louisiana, Pike County, Mo., November 11, 1889.

REPLY.—Your letter of the 11th instant has been received and referred to the Entomologist, who reports that he is obliged to you for your notes on Anguillula, and that he himself has for some time been aware of the fact that many other plants were damaged by these creatures in addition to those mentioned by Dr. Neal; also that the work is by no means confined to the vicinity of the sea-coast. The knots on Apple, however, may have been due to some other cause.—[November 20, 1889.]

A Fuchsia Aleurodes.

The fuchsias in my bay window are infested with scale-like cocoons, on the under side of the leaves, from which emerges a tiny white fly. Please tell me something about it. I send specimens of cocoons and flies in a wax cell mounted on a slide. It is so arranged that you can remove the cover glass if you find it necessary. The flies are alive. What are the peculiar objects like crystals? They polarize prettily, not unlike horn or keratose. Besides the mount, I send leaves infested.—[Samuel Lockwood, Freehold, N. J., January 15, 1890.]

REPLY.—The little insects which you find on fuchsia leaves belong to a species of the genus *Aleurodes*. I have had this form for some time, but it is yet undescribed. The family *Aleurodidæ*, as you know, holds a position between the Aphididæ and the Coccidæ, and has not been studied in this country.—[January 18, 1890.]

The Skein Centipede and Silver Fish.

There are two *creatures* that have the freedom of this town, about which I have heard a great deal of nonsense talked, and now wait for some sensible information. Whether they are *insects* or not, I do not know; I wait for you to tell me, but certainly they must often stroll into the suburbs of your province. I never knew any one who could give a popular name to the first creature, which, for the sake of distinction, I call in the house a *centipede*, which it is not. The first I ever saw was five inches long, at least. I thought it was a skein of brown silk in a tangle, and picked it up from the carpet with thumb and finger. I have never seen another as large, but the wet weather brings them into the bath-room in two sorts, one as I have described it, brown and tangled, the other of the same general shape, but with distinct antennæ at one end, and something similar at the other, black and smoky in color. If you kill

either there is no body left, only a ghost, which has no anatomy. I hope you appreciate my scientific knowledge.

The other goes popularly by the name of "*silver fish*." It also is a creature of the damp. The colored people declare it is the husband of the moth. I killed one in May that looked formidable for it was more than two inches long. When I returned this autumn a bit of flannel that had been carelessly left out was riddled with moths, and as I took it up to throw it in the fire a very large "silver fish" slipped out to meet a speedy doom. Such is the origin of the myth, I suppose. Now, can you refer me to any Government bulletin which will give me the biography of these unwelcome visitors, or any book? If not, will you give me some of the facts yourself and introduce me to the husbands and wives, if they do not have a family likeness.—[Caroline H. Dall, No. 1603 O Street, Washington, D. C., November 12, 1889.

REPLY.—Your letter of the 12th inst. was duly received, and while it would have been desirable to have received specimens of the "creatures" to which you refer, your interesting description of them leaves little doubt as to their identity. The one which you call a centipede—and it is one—has no definite common name other than "Thousand-legs," or the more inaccurate "ear-wig," but is known to science as *Cermatia forceps*. The two sorts observed by you were only different phases of the same animal, the tangle being either a dead specimen or the exuvium (for, like all Arthropods, it molts). Little is known of the habits or life-history of this widely distributed pest, which of late years, particularly, has frequently occasioned annoyance in houses. It is undoubtedly carnivorous in habit, however, probably feeding on other household pests, which its quick movements enable it to capture. There is current belief, well founded, I think, that it feeds on young roaches. Its bite, while reputed poisonous, is not dangerously so; and I have personally never known of injury so resulting and much doubt if there is foundation for the belief. It may, however, be considered as a friend, but its singular appearance and rapid movement are hardly calculated to inspire confidence.

The "silver fish" of your letter is without doubt the well-known pest of books and clothing (*Lepisma saccharina*), and is entirely distinct from the clothes moths. It feeds particularly on starched clothes and the binding of books, which it eats for the starch, and sometimes injures silks and other fabrics. Pyrethrum will prove effective, also, against this last insect. I am sorry to say that there are no publications of the Department relating to these pests for distribution. The first is fully described by Dr. Lintner in his fourth report on the insects of New York, and the second is briefly described in Packard's "Guide to the Study of Insects," p. 623.—[November 13, 1889.]

A Guava Scale.

I send you a branch of guava tree, the first and only one that I have ever seen infested with any kind of an insect enemy. I suppose this to have come from a large rubber tree near by. The rubber tree is often covered with this black dust and same kind of a scale. Will you please tell me the name of this creature, and whether it will be likely to spread to other guava trees; and if so, how can we best dispose of it.—[E. Gale, Lake Worth, Dade County, Fla., November 13, 1889.]

REPLY.—The specimens which you send from guava are common Florida wax-scales (*Ceroplastes floridensis*). You will find this insect figured and described in Hubbard's Insects affecting the Orange. It commonly affects the gall-berry, but is also found upon quince, apple, and pear, and occasionally upon orange. It can be destroyed by the ordinary kerosene soap emulsion, which, however, should preferably be applied when the insects are young.—[November 20, 1889.]

The Tile-horn Borer.

Last year I sent you specimens of borers which were destroying an ash tree in my yard, and worms also found in a large oak in the same yard. The ash tree died. By this mail I send you another specimen of borer, found in the heart of a large oak

which died last fall, the sap timber of which looks like a coarse sponge. I send the oak chip in which the destroyer was found. I very much fear that the fly or moth is depredating upon other oaks in the yard. How can we distinguish it, and is there no protection against it ?—[Carrington Mason, Memphis, Tenn., October, 22, 1889.]

REPLY.—The larva is that of one of the large Tile-horn beetles (genus *Prionus*). The particular species is probably *P. laticollis.* For an illustrated account consult Riley's second report on the insects of Missouri, p. 78.—[October, 1889.]

The Boll Worm.

As you are chief of the entomological division of the Department of Agriculture, I take the liberty of writing you in regard to a pest that is fast destroying the prosperity of the cotton farmer of this section of our State and reducing us to penury, and will ultimately, if help does not come, force us to abandon cotton culture. That pest is the "boll worm." Much discussion has been had in our local press—many things have been advised and tried—but their ravages were greater the past season than ever before, and I feel convinced that something else will have to be done than we have hitherto adopted. Paris green, London purple, burning of lamps to catch the miller, are among the best of the remedies resorted to, but all have proved comparative failures.

I am not an entomologist, but necessity has forced me to give some attention to this matter, and this attention has been followed by the conviction that our most certain method of relief will be found in the line of fostering and caring for those natural enemies, parasites and otherwise, which we know by observation do exist here, or which observation teaches by parallel lines of investigation, may exist elsewhere and can be introduced here. Could you give us any help; and, if so, will you ? I have read carefully reports made by yourself to the Department in 1881 or 1882, and thank you and the Department therefor, but we need something more.

We need, I think, bulletins scattered broadcast throughout this part of Texas (east Texas) containing the information in your reports, and such other practical suggestions as may occur to you or others who are familiar with the life-history of this pest and those parasites, its natural enemies, to be found here; and besides this, a more thorough search for something that will prove of more utility than anything hitherto suggested.—[H. L. Tate, M. D., Lindale, Smith County, Tex., January 12, 1890.

REPLY.—Your letter of January 12 relative to the boll-worm has been received. I have sent you to-day a copy of the Fourth Report of the U. S. Entomological Commission, in which you will find the subject treated from the latest stand-point. If you have read nothing from me upon the subject since 1881–'82, you will find this matter interesting. There is little to be hoped for in the direction which you particularly mention, viz, the assistance of parasites. As it happens, the boll-worm is singularly free from the attacks of parasitic insects, and up to the present time only one or two have been recorded. These, moreover, are very rare and do not seem to breed in any abundance. The best hope is in spraying with Paris green and in worming the neighboring corn-fields, as indicated in the report which I send you. If it seems necessary, we may give some further attention to the matter the coming season.—[January 17, 1890.]

Feather Felting by Dermestids.

I have in my possession a beautiful curiosity, and, as far as I can learn, the only one in existence. I take the liberty of addressing you in regard to it, as you are authority on entomology, and this will probably come under that head.

It is an ordinary feather-pillow tick, which was made of common bed-ticking and filled with the domestic duck feathers about three years ago and the pillow has been in general use about the house since that time. Of late the lady concluded to remove

some of the feathers, as the pillow appeared too hard. Upon opening the tick the feathers seemed to be ground up almost into a powder and unfit for further use; therefore they were emptied and the tick turned inside out, and instead of the goods being as when made, it was entirely covered with a fine growth of down as evenly and thickly as the fur on a mole-skin, which it very much resembles; it is firmly attached, the down breaking rather than pull off. Not a piece of the feather is attached to it but as smooth as a piece of velvet, even the seams are covered by the growth. Not an insect can be found in the feathers, but the grinding process was supposed to be done by some insect. The lady made several pillows at the same time and of the same feathers, but when these pillows were opened nothing was found but feathers as when made. This was found about a month ago and the ladies through the country have opened many pillows, some as much as fifty years old, but no such thing can be found. To look at it one would think it the hide of some animal, and would never imagine it to be a pillow-tick except by close inspection. I inclose some of the feathers, which will give you an idea of the color and a description from the local paper which may help to give you an idea of its appearance. Many theories as to its formation are offered, but nothing satisfactory, and the community would like your opinion. * * * —[J. D. Davis, Clarksville, Mo., January 19, 1890.

REPLY.—Yours of the 19th inst., together with the specimens of feathers, duly received. A careful examination of these fragments shows no trace of an insect or of insect remains. The specimens which you have are very interesting, although I have seen the same thing before and several notes have been placed upon record regarding precisely similar cases. In the *American Naturalist* for December, 1882, I mentioned one of these cases and gave an explanation which is as follows:

Pillows in which this felting of the ticking occurs have been infested by one of the Dermestid beetles (in all of the cases with which I am familiar it has been *Attagenus megatoma*) whose work has resulted in the comminution of the feathers, and the felting results from the subsequent mechanical action. The small feather particles are barbed, as you are aware, and, whenever caught in a cotton fabric by their bases, become anchored in such a way that every movement of the pillow anchors them still further. The frequent shaking which pillows receive results ultimately in the formation of this plush-like surface. A similar bit of ticking was exhibited at the Philadelphia Academy of Natural Sciences, April 5, 1883, and elicited the information that one of the members had some years previously examined a similar material known to have been formed from the fragments of gull feathers and that a cloak had been made from it which wore well. * * *—[January 23, 1890.]

Extreme Ravages of Cut-Worms.

As our part of the country has been ravaged this year by the Cut-worm, which I believe is the same one that destroyed the onion crop of Orange County, N. Y., in report for 1885, p. 270, I would like very much to know if you have any subsequent information in regard to the habits of the moth or worm; if so, I would be very grateful for report containing it. Corn has been the crop that has suffered here, and as some fields are totally destroyed, the damage in these parts will amount to many dollars. I will give my case as a sample. I have four pieces of 28, 6, and 5 acres. The first three pieces were planted with Lister, beginning May 10. First planting was a total loss. Replanted all on the 28-acre piece. All destroyed the second time except 3 acres with about one-fourth stand left. Second piece was a total loss, and was sowed with one-half bushel to acre for fodder; at present writing it shows very little corn, as Cut-worms take it not quite as fast as it comes up. Third piece gave less than one-fourth of a stand. Fourth piece was plowed, having been broken last year, and is about one-third stand with Cut-worms still working. I tried cutting, growing rye, and Paris greening to poison them, but the bait was not succulent enough. I think I could have killed a good many if I had used suitable bait. Have found seven

worms eating at one stalk of corn under the ground. Last year I also suffered with Cut-worms. Planted 18 acres, replanted 16, and then sowed corn on 3 of it. The sowed corn was all right; balance produced one-fourth stand. If they increase next year over this year, corn planting will be useless.—[Chas. A. Hewitt, Neligh, Nebr., July 4, 1888.

REPLY.—In addition to late fall plowing the best remedy which you can use is the poisoned bait with which you are already familiar. The only difficulty is to secure green and succulent vegetation for poisoning; and, of course, being upon the ground, you can more readily decide what will be best and most convenient to use.—[July 10, 1888.]

ANOTHER LETTER.—In looking over the reports of 1884, just received, I notice an article upon Cut-worms, which is of importance to us away up here in northwestern Minnesota, and I desire to ask your advice on how to proceed in my war upon them. I am on the southeast shore of Otter Tail Lake near Otter Tail City: my land is a sandy loam, was timber land in 1850, but now nearly clear of timber by reason of the encroachments of prairie fires. Consequently the soil is a warm productive soil, quick to warm up in the spring, and a good harbor for all sorts of insects.

I have for two years past failed to raise onions, beets, and carrots, and beans too, as well as nearly an acre of sweet corn, on soil only under cultivation three years. Onions, beets, carrots, and beans were sown with a "Planet, Jr.," garden drill; they were cut off as fast as they came to the surface, just below the surface, by very small young Cut-worms. Neither salt nor ashes would stop their work; the crop was an entire loss. Now, what can I do? As I sow two or three acres I can not apply the remedies laid down in the 1884 report, pp. 299–300, as it would lose too much in time and labor. But I do want to raise onions, beets, and carrots as well as beans and sweet corn.—[Washington Muzzy, Balmoral, Otter Tail County, Minn., March 4, 1887.

REPLY.—While late plowing of the fields infested by cut-worms may have a good effect in lessening the numbers the ensuing season, a much better plan will be the adoption of the poisoned ball system recommended in the article to which you refer. This method will not require the expenditure of much time or labor. It simply involves the necessity of a pretty general distribution of poisoned spring grass over the plowed fields a few days before the sowing of your onions, beets, carrots, or beans. There will doubtless be plenty of young grass and weeds up at the proper time, and such should be cut and sprinkled with Paris green solution and little patches placed at intervals about the field. This is absolutely the best remedy known. It works admirably in the South, where there is so much early vegetation, and we shall be glad to learn your opinion of its practicability in Minnesota, or of the success of any experiment you may try with it.—[March 9, 1887.]

Migrations of Plants as affecting those of Insects.

When the writer first came to this part of Kansas, eighteen years ago, two plants which are now very abundant were unknown in this county of Geary, then called Davis. One of these is the *Solanum rostratum*. The region for two or three years suffered from the ravages of the Colorado Potato-beetle, but now, though the beetle is sufficiently abundant every year, the potatoes rarely are damaged. The cause seems to be that *Solanum rostratum*, sometimes called Buffalo Nettle, or Buffalo Thistle, is the native food-plant of this beetle, and where it is scarce *Solanum tuberosum* is accepted as a substitute. The plant belongs to regions farther west, and by some means the beetle traveled in abundance eastward, reaching the other side of the Atlantic years ago, where the plant is still unknown. It is said that the prickly seed-pods of this plant came on the tails of Texas and other cattle from the Southwest, and it is certain that counties remote from the cattle-trails and the through lines of railway were the last to have the plant. The flower is bright yellow, and the whole plant not unhandsome, but its prickles make it a very undesirable

weed. Two years ago the writer took particular pains to eradicate it in and around his garden patch, killing every young plant of *S. rostratum* as it came up. The result was a serious attack on the potatoes, which were only saved by twice going over all the plants and collecting and destroying the beetles. That the plant did not migrate easterly at a greater speed—I don't think it has crossed the Mississippi yet—is to be wondered at, as in the region of the one hundred and second meridian, on the wide prairies, it has the tumble-weed habit. The whole plant is subglobose and when ripe snaps off close to the ground and goes bowling along before the wind at a great rate. The winds there, however, are more north and south than from the west, so that probably has delayed the progress of the plant in longitude. The plant is abundant in waste places in towns and by roadsides in all eastern Kansas now, and we rarely hear of the Colorado Beetle damaging potatoes.

Another plant which is traveling eastward is the Mexican Poppy, Prickly poppy, or, as some have called it, California Poppy. It is the *Argemone mexicana.* Many years ago, sixteen or seventeen, the writer first saw it in the region of the one hundredth meridian, and he noticed it more easterly every year since. Several years ago an illustration in *Harper's Magazine* to an article entitled "Ladies' Day at the Ranche," showed it as being a prominent flower in Ellsworth County. It is very abundant in waste lots of Junction City now, and the last season it was seen as far east as Wamego, about the ninety-seventh meridian. It may be further east, but the writer has not seen it. It is a very handsome plant, with a very large white flower, manifestly the variety *albiflora.* It may be that the migration of these plants has elsewhere been recorded, and that it may have proceeded further than is here set down, but it seems that the record is worth preserving if not previously made.—[Robert Hay, Junction City, Kans., February, 1890.

Hymenopterous Parasite of Icerya in Australia.

I have done a little as follows: First, I have bred four hymenopters, which I take to be the parasite which Koebele discovered. All I know about them is I found them alive in a bottle containing some Icerya, and from which some Lestophoni had emerged. The hymenopters had not emerged from any Lestophoni outside the Icerya, but that one would not expect, still I have no proof that they were not parasitic on the Icerya; but I presume they are Koebele's parasite. I found two out of the four.

Second, I received some three months ago some Icerya from a place some 50 miles south of Adelaide, the owner of the orange orchard not having seen anything of the kind before and wanting to know what they were. These I placed as usual in a bottle loosely stoppered with cotton wool. With the Icerya was a Chrysopa larva, which for some weeks was busy feeding on the eggs. One day on examining it I discovered several Hymenopters (Proctotrupidæ?). The female, yellowish-brown (?); male, almost black (?). On examination I found that many might have escaped through the cotton stopping being insecure, but I suppose I have had about thirty since. It is strange that this is the only instance of an hymenopterous parasite of Icerya yet discovered in South Australia. I send you a few of these under separate cover. I presume the small black insect is the male, because I observed them chase the larger brown flies, and then leap on their backs, but so far in front that it would be impossible for any sexual connection to take place (at least in my opinion), and then would commence a rapid movement of the antennæ, as if they were having a bout of fisty-cuffs. I observed this three or four times, but in no case did I observe any act of coition—as the bottle was not very well suited for observation with a coddington lens, it may be that I am mistaken, but such is my impression. This strange proceeding would last a few seconds. Was it a kind of preliminary investigation on the part of the male to discover whether the female had been already impregnated?

I likewise send you some cayenne pepper in which you will find some small beetles which breed in that very hot condiment. A sole diet of cayenne pepper must make them peculiarly hot tempered if beetle life in any way resembles human existence.

Do you know of any such habit in the States?—[Frazer S. Crawford, Adelaide, South Australia, November 24, 1889.

REPLY.— * * * In reference to the specimens which you sent, No. 1 is *Euryischia lestophoni* Riley MS. No. 2 interests me intensely as it is the first primary Hymenopterous parasite on *Icerya* from Australia. I propose to characterize it and name it *Ophelosia crawfordi*,* if you have no objection. It is somewhat near *Dilophogaster*, which is a parasite on some allied Coccids, but will have to form a distinct genus. I shall be very glad to get some additional specimens of this for the Museum collection, but particularly should be obliged to you if you could succeed in sending over a box of living specimens with a few *Icerya* for them to breed on. Better still, if you could get a good supply of *Icerya* from the tree or neighborhood where these were found, the chances would be very good of some of them coming out on the journey, or even after they arrived in California. I should like to have some sent to Mr. Koebele at Alameda, and also some to Mr. Coquillett at Los Angeles.

The beetle in red pepper is the well-known cosmopolitan *Sitodrepa panicea*.—[January 10, 1890.]

Proconia undata Injuring the Vine.

Inclosed please find envelope containing two specimens of an insect; it is of average size and first made its appearance about ten or fifteen days ago. Its mode of operation is to stick its sucker or bill into the young shoot of the vines and commence to *pump*. The water of the vine passes immediately through the bug, which can plainly be seen with the eye by holding your hand under it. When it is at work, your hand in about one minute will be covered with water, just about like the morning dew. Its bill is placed near where its head joins its body. It is very destructive to the vine; the leaves it does not attack, only vines, stems of the leaves, and the stems of the bunches of grapes. Inclosed please find cutting from the vines. The leaves of the vine were also eaten, but by some other insect, as I have failed to find this bug eating the leaves. If there is any remedy for the destruction of them please let me know at once.—[A. B. Daily, San Marcos, Tex., May 10, 1886.

REPLY.—The insect which you send is one of the common leaf-hoppers of the vine and is known as *Proconia undata*. You describe its work very well, and if it appears in sufficient numbers to threaten your vines seriously, it will be well for you to spray them in the heat of the day with an emulsion of kerosene and soap, according to the usual formula. The leaves on being examined showed the appearance of a fungus (*Phyllosticta labruscæ*), which produces the rust colored spots. If this fungus appears extensively you will find a remedy in dusting the vines with sulphur and lime.—[May 17, 1886.]

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* Since described on p. 249 of the current volume.

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX, WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord Walsingham.

[*Continued from page* 286 *of Vol. II.*]

COPTOTRICHE gen. nov.

Κοπτειν = to cut; Θριξ = a hair.

Tischeria complanoides F. & B. = *latipennella* Chamb.

Antennæ, ♂, ciliated, a minute projecting hair pencil from the basal joint beneath
Labial palpi, dependent, scarcely longer than the head.
Haustellum, rather long.
Head, clothed with an erect tuft above; face smooth.
Fore-wings, lanceolate, pointed, clothed with long cilia commencing abruptly at the outer end of a distinct cuticular fold which extends from near the base of the costal margin to three-fourths of the wing-length on the underside, and is of nearly even width throughout; beneath the fold two-thirds of the wing-surface is thickly clothed with long hair-like scales arising most conspicuously from the submedian vein. *Neuration*, 9 veins, apical vein forked, the branches ending on opposite sides of the apex; the remaining veins simple.
Hind-wings, lanceolate, as wide as the fore-wings, the costal margin suddenly depressed at the outer fourth, ending in a sharp point almost in a line with the dorsal margin; the first half of the costal margin is clothed with very long cilia, and the cilia on the dorsal margin are also very long, but at the depression above the apex these are abruptly shortened, giving an excised appearance as if caused by an injury.
Abdomen, anal tuft moderate; terminal segment ending in a pair of well-developed lateral claspers, uncus apparent.

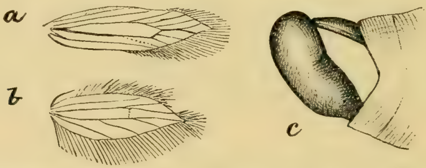

FIG. 64.—*Coptotriche complanoides*: *a*, *b*, neuration of front and hind wings of male; *c*, genital segments of male—enlarged (Walsingham *del*).

This genus differs from *Tischeria* in its much wider hind-wings, somewhat abruptly pointed downwards at the apex, in the long tufts of hair-like scales on the underside of the fore-wings, and in the conspicuous costal fringe along the basal two-thirds of the hind-wings and in the excised appearance of the costal cilia above the apex.

Coptotriche complanoides F. and B.

Tischeria complanoides F. and B. (*zellerella* F. and B.)
n. syn.=*Tischeria latipennella* Chamb.
(?=*Tischeria zelleriella* Clem.)

Clemens described *zelleriella* [Proc. Ac. Nat. Sci. Phil., 1859, 326. (Stn. Tin. N. Am., 81)] as having bluish-gray hind-wings, the fore-wings yellowish running to reddish saffron towards the tip. He mentions also a supposed female entirely reddish-ferruginous.

Frey and Boll [Stett. Ent. Zeit., XXXIV, 220-1 (1873)] described their specimens of *zellerella* as having the wing-tip of the same color as the base.

Zeller [Ver. Z.-b. Ges. Wien, XXV, 147 (1875)] refers to a specimen sent him by Frey under this name and expresses a doubt whether it is truly Clemens' species ; he also draws attention, for the first time, to the peculiarity of hind-wings which is also the distinguishing character of *latipennella* Chamb.

It is remarkable that neither Frey nor Clemens should have observed this.

The specimen referred to by Zeller is now before me and considering the degree to which the outer portion of the wing is shaded with darker scales it is possible that it may be rightly identified by Frey.

A series of six specimens, all males, received from Miss Murtfeldt and from Monsieur Ragonot (from Boll's collection) show the peculiarity of the hind-wings in a marked degree, sufficiently I think to constitute a separate genus. The difficult question, however, is to decide which of the numerous oak-feeding species described from North America is the female of this form. One specimen regarded by Miss Murtfeldt as *badiella* Chamb., although slightly smaller and lacking the peculiar outline of the hind-wings of the male, appears to me to agree in all necessary particulars; it also differs from *badiella* in the absence of a dorsal spot, agreeing in this respect with *castanella* Chamb. Chambers' remark that *castanella* is larger than *zelleriella* further proves that his idea of that species was not the same as that of Frey and Boll, whose specimen is a large one. It would be rash to presume that *castanella* is merely a synonym of *zelleriella*—this and other allied species require further study. It is, however, quite certain that the *zellerella* of Frey and Boll (for which they suggest the name of *complanoides* if distinct) and of Zeller's writings is equal to *latipennella* Chamb., and it is probable that one of the other species, if described from females only, will turn out to be the same. Frey and Boll refer to the female, but as they overlooked the peculiar form of the male, little, if any, assistance can be derived from their brief notice. Chambers did not mention that he had both sexes of *castanella.*

I shall be greatful to any one who will examine Clemens' type ♂ of *zelleriella* and let me know whether the hind-wings have an excised appearance, caused by the shortening of the cilia above the apex (see Fig. 64 *b*). Until I can assure myself on this point *zelleriella* Clem. must be retained in the index as a distinct species, and Frey and Boll's determination, which was questioned by Zeller, must be regarded as erroneous.

C. complanoides has been received from Texas, Missouri, and North Carolina.

TISCHERIA Z.

Tischeria clemensella Chamb.

=*zelleriella* Chamb. [Cin. Qr. Jr. Sc., II, 109–110 (1877)].

I am quite unable to identify this species from the material in my possession. It may be possibly the true *zelleriella* Clem. as suggested by Chambers [Bull. U. S. G. G. Surv., IV, 98–9 (1878)], in which case Frey and Boll's identification of that species must be incorrect. No reference is given to this name in the Index, but a specimen exists in Cambrige Museum (Mass.), received from Chambers [Hgn. (Frey) Pap., IV, 153 (1884)].

Tischeria castanella Chamb.

I am unacquainted with this species except from the description.

Tischeria citrinipennella Clem.

n. syn.=*badiella* Chamb.

This is a lemon-yellow species. The distinguishing mark noticed by Stainton [Tin. N. Am., 82 (1872)]—a patch of dark scales at the anal angle—was not mentioned in the original description, but exists in a specimen in my own collection com-

pared with the type in 1871. This is characteristic also of *badiella* Chamb., indeed so far as I am aware it occurs only in this species and in the darker *tinctoriella* Chamb. I am unable to trace the patch near the base of the hind-wings mentioned by Clemens. Chambers suggests that his *badiella* may be Clemens' *zelleriella*, but his description agrees in all important points with my example of *citrinipennella*, and I have no hesitation in regarding his name as a synonym.

Tischeria quercitella Clem.

n. syn.—*quercivorella* Chamb.

Chambers in discussing the distinctions between his *quercivorella* and *quercitella* Clem. [Bull. U. S. G. G. Surv., IV, 97 (1878)] regards Frey and Boll's identification of the latter as erroneous. I have a specimen sent by them to Zeller and am certainly disposed to agree with Zeller that it is rightly identified. Despite the minor points relied on by Chambers for its separation, I think the strong fuscous patch at the base of the fore-wings on the under side, and on the base of the hind-wings on the upper side, showing through to the under side, but not actually on that surface as suggested by Chambers, are sufficiently noticeable characters to justify the conclusion that they are the same. I possess also a pair of this species taken at Washington, D. C., April 29, 1871.

Tischeria sulphurea F. and B.

I have specimens of what I can only suppose to be this species received from North Carolina collected by the late H. K. Morrison. I also took it at Washington, D. C. on the 29th of April, 1871, and I am unable to separate from it specimens obtained on Mt. Shasta, Siskiyou County, Cal., in August of the same year—which would prove that there are two broods.

Tischeria fuscomarginella Chamb.

I have received this species from Miss Murtfeldt from Kirkwood, St. Louis, Mo., and from Monsieur Ragonot from Dallas, Tex., from Boll's collection.

Tischeria concolor Z.

I have specimens of this species collected at Kirkwood, St. Louis, Mo., by Miss Murtfeldt, and have received others from Monsieur Ragonot, taken by Boll, at Dallas, Tex.

Tischeria bicolor F. & B.

This species is only known to me from the description.

Tischeria tinctoriella Chamb.

Miss Murtfeldt has kindly sent me specimens of this insect collected at Kirkwood, St. Louis, Mo.

Tischeria helianthi F. & B.

I am indebted to Monsieur Ragonot for four specimens, labelled "Texas, Boll, *Tisch.* von *Helianth, m.*"

Tischeria solidaginifoliella Clem.

I have a single specimen of this species, which was also sent me by Monsieur Ragonot, who received it from Boll from Texas.

Tischeria pruinosella Chamb.

A single specimen of this insect is in my collection. It was received from Belfrage from Texas.

Tischeria pulvella Chamb.—Tischeria longe-ciliata F. & B.

These species are only known to me from the descriptions.

Tischeria heliopsiella Chamb.

Tischeria heliopsisella Chamb.
n. syn.—*T. nolckenii* F. & B.

This species is recorded by Chambers as bred from leaves of *Heliopsis lævis* and *Ambrosia trifida* in Kentucky [Cin. Qr. Jr. Sc., II, 113–4 (1875)]. I met with it also on Mount Shasta, Siskiyou County, Cal., in August, 1871, at an elevation of about 6,000 feet, mining the leaves of a species of *Ambrosia;* the mine occupying the whole width of the narrow leaflet. The specimens were bred in the same month. Its general aspect is that of a *Bucculatrix.* Two specimens received from Monsieur Ragonot, collected by Boll in Texas, labeled "*Tischeria nolckenii* F. & B.," agreeing in all respects with the description by Frey & Boll [Stett. Ent. Zeit., XXXVII, 220 (1876)] have been compared with Chambers' description of *heliopsisella,* and also with a specimen, kindly lent me by Miss Murtfeldt, which she received from Chambers, bearing the label "*Tischeria heliopsisella* Chamb. Ky." I have no hesitation in regarding *nolckenii* F. & B. as a synonym of *heliopsisella* Chamb.

Tischeria ambrosiella Chamb.

I have four specimens of this species bred from *Ambrosia trifida* by Miss Murtfeldt, at Kirkwood, St. Louis, Mo. Chambers also records it as bred from *Ambrcsia artemisiæfolia* on Miss Murtfeldt's authority [Cin. Qr. Jr. Sc., II, 113 (1875)]. It is apparently a good species and distinct from *heliopsiella.*

Tischeria ceanothi sp. n.

Antennæ, pale grayish-brown, strongly ciliated in the ♂.
Palpi, pale grayish-brown.
Head, roughly clothed with pale grayish-brown scales tending to whitish in front; face whitish.
Fore-wings, grayish-brown, with a faint purplish tinge, in some specimens somewhat paler along the dorsal margin below the fold, a faint indication of a small darker spot about the anal angle; cilia pale grayish-brown. Under side rather shining grayish, slightly darker than the hind-wings.
Hind-wings, pale grayish; cilia scarcely lighter.
Abdomen, the same color as the hind-wings, anal tuft inclining to ochreous.
Legs, luteous; anterior pair darkened with fuscous and having the tarsal joints obscurely spotted.
Exp. al., 6^{mm}.
Habitat, California.
Type, ♂ ♀, *Mus. Wlsm.*

The larva mines the upper side of the leaves of *Ceanothus divaricatus* Nutt., making at first a narrow mine which gradually increases in width, but is apparently never wider than about one-fifth of the leaf; several mines are to be found in a single leaf. I have one before me which contains five. The larva changes to a pupa within the mine. There is no indication whatever of its presence on the under side of the leaf. I met with it at the head of the Noyo, Mendocino County, Cal., on the 8th–11th

of June, 1871, in considerable abundance, the whole shrub being covered with mined leaves. I also took it on the wing in Mendocino County, 27th May, 1871. I have received the same species from Dr. Riley, collected at Placer County, Cal., in October, thus showing that the insect is on the wing at three separate times, viz., May, July, and October—possibly three distinct broods.

Tischeria malifoliella Clem.

Two specimens in the Zeller collection, received under this name from Boll from Texas, agree with my specimen compared with Clemens' type in the collection of the American Entomological Society, Philadelphia, in 1871.

Tischeria ænea F. & B.

There is a single specimen of this species in the Zeller collection received from Boll from Texas.

Tischeria roseticola F. & B.

I have specimens of this insect from the Zeller collection, and from Monsieur Ragonot received from Texas from Boll, and am indebted to Dr. Riley for a third example bred from rose.

BEDELLIA Stn.

Bedellia somnulentella Z.

This species, already recorded from North America by Clemens on Stainton's authority [Proc. Ent. Soc. Phil., I, 147–9 (1862)—Stn. Tin. N. Am., 189–91], is very widely distributed, occurring in Australia and New Zealand as well as in Europe. I have received it from Belfrage from Texas, and have myself met with it on McLeod Creek, Siskiyou County, Cal., at the end of July, 1871.

(*To be continued.*)

GENERAL NOTES.

A RHIZOCOCCUS ON GRASS IN INDIANA.

January 22, of the present year, Director Stockbridge, of the Indiana Experiment Station, placed in my hands a number of egg sacs, seeming to be identical with those mentioned in INSECT LIFE, Vol. I, p. 345, from Dakota, and *loc. cit.*, p. 385, from Nova Scotia. These were given Director Stockbridge by Mr. James Powers, of Lexington, Scott County, Ind., and were attached to blades of dead grass, the dried remains of the female being in most cases still attached to the anterior end of the sac. A week later the sacs were placed on growing plants of timothy and blue-grass, and on February 17 the leaves of these grasses, and also the surface of the soil in the pot containing them, were alive with minute, active, yellowish coccids, having much the color and appearance of

young *Thripidæ*, except that they were more robust. The larger portion of these young seemed to forsake the grass and wandered away, while those that remained died in spite of every attempt to rear them.

In a letter to Dr. Stockbridge, written February 18, Mr. Powers gives the following interesting facts: The coccids occurred in spots, comprising the lower portions of about 5 acres of a low meadow, composed of timothy and red top. The meadow was of three years' standing, having been preceded by a crop of wheat. Up to about February 1, the sacs had been observed in great abundance, but a visit to the field on the 17th revealed the fact that all had disappeared—hatched, Mr. Powers supposed. Other meadows in the neighborhood did not appear to be affected.

I have never observed this in Indiana myself, the only coccid found by me being quite different, and affecting blue-grass, where it is not uncommon in August. These occur about the base of the leaves near the surface of the ground; at least this is the only place I have found them. They seem to belong to the genus *Westwoodia*, and I have observed what appears to be the same thing also on blue-grass in Illinois, and understand that Mr. Pergande has also found it on the same plant about Washington.—[F. M. Webster, March 10, 1890.

FURTHER NOTE ON THE EGYPTIAN MEALY BUG.

On page 256 of the current volume we published a note upon this insect, based upon information kindly sent us by Mr. D. Morris, of the Royal Kew Gardens, England. We notice by the March number of the *Entomologists' Monthly Magazine* that Mr. Douglas has found it necessary to erect a new genus for this insect, and that he calls it *Crossotosoma ægyptiacum*.

INDIAN RHYNCHOTA.

Mr. E. T. Atkinson, of Calcutta, has favored us with the second part of his Catalogue of the Insecta of India, which comprises a bibliographic and synonymical list of the family Capsidæ. We have seldom seen a work of this kind which displays such thorough and painstaking work. It is much more extensive than we had anticipated, covering one hundred and eighty odd royal octavo pages of brevier type. There is a full bibliographic list, an index to genera and an index to species.

TWO PARASITES OF THE GARDEN WEB-WORM.

In our article upon *Eurycreon rantalis*, commonly known as the "Garden Web-worm" in our annual report for 1885, the only parasite mentioned was a Tachina fly, reared by Professor Popenoe, at Manhattan, Kans. In 1888 this insect was again abundant in parts of Colorado, Arkansas, and Texas, and we reared an Ichneumonid in early

July from pupæ received from Mr. W. F. Avera, editor of the *Ouachita Herald*, of Camden, Ark., who had noticed the larvæ damaging cotton. This parasite has been described by Mr. Ashmead on p. 437 of the Proceedings of the U. S. National Museum, Vol. XII, 1889, as *Limneria eurycreontis*, and we present herewith a figure of the female sex. The eggs are laid in the larvæ and those specimens which we reared issued from the pupæ. Many Limnerias, it will be remembered, issue from the larvæ of their hosts before the latter have transformed.

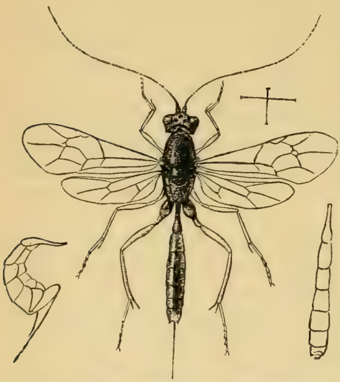

FIG. 64.—*Limneria eurycreontis*—female with abdomen and ovipositor shown detached at left; male abdomen at right—enlarged (original).

We also reared about the same time, from the same lot of webworm pupæ, specimens of a Braconid parasite, which we have determined as Mr. Cresson's *Agathis exoratus*.

AN APHIS ATTACKING CARROTS.

In his report as State entomologist of New York, for the year 1886, p. 123, Prof. J. A. Lintner records the reported appearance of Aphides on carrots and parsnips, at Oakley Park, Mass., in sufficient numbers to seriously injure the crop. As no further particulars or specimens were furnished the professor, and as this is the only case on record where the carrot in this country has been attacked by Aphides, we are left totally in the dark as to what particular species was engaged in the depredations.

Buckton* states that *Siphocoryne pastinacæ* (Linn.) was found abundantly on carrot, at Haslemere, in July, and Curtis† says that in 1847 a field in Gilford, Surrey, was about one-tenth destroyed by an attack of *Aphis dauci* (Fab.), and another species of Aphis occurs in October about the roots. Miss Ormerod ‡ tells us that a serious attack occurred at Newton Farm, near Glasgow, in 1879, and also states that carrots are attacked by several kinds of Aphides, among them *Aphis papaveris* Fab., which infests the leaves, and *A. carrotæ*, which affects the flower stems, and also the below-ground portions of the plant. M. Lichtenstein § names in his list seven other species which infest the carrot, three of them attacking the parsnip also.

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* British Aphides, Vol. II, p. 24.

† Farm Insects, p. 403.

‡ Rep. Obs. Inj. Ins., 1882 (Sixth Report), p. 18.

§ Lintner, Rep. St. Ent., N. Y., 1886, p. 123.

In January, 1889, we observed the seed heads of carrots in a garden near Hobart, Tasmania, thickly populated by a species of *Rhopalosiphum*.*

On October 3, 1888, I found several carrots in a field near La Fayette, Ind., infested with an *Aphis* which Dr. Riley found to closely resemble *A. plantaginis*, and also a species which occurs in the vicinity of Washington, D. C., on the roots of *Portulaca*. At this time those observed by me were clustered on the bases of the *leaf stalks and also on the fibrous rootlets.* A few days later, what appeared to be the same species was found on the roots of *Portulaca oleracea*, and specimens from both this and the carrot were placed in a breeding cage, where both plants were accessible. So far, I had only observed wingless individuals, and these seemed to be all females; at least I saw no males. Soon after the 28th of October the females in the breeding cage began to deposit eggs on both carrot and *Portulaca*. This was continued up to the 5th of November, when I was called away for several weeks, and on my return, November 26, all had disappeared.

The eggs were light-colored immediately after deposition, but soon became shining black, like those of *Aphis mali*, but were rather smaller. As I left home soon after for an absence of several months, no opportunity was offered to watch the development of the eggs.

On August 15, 1889, the same species was found, both on the rootlets of carrot several inches below ground and also on the roots of *Portulaca oleracea*. On the 23d of the same month apterous individuals were observed on the roots of the latter plant, and among them a winged female.

October 16, examples, differently colored, but seemingly belonging to this species, were found on salsify. Although the attempt was made to rear them on this plant, the result proved a failure, and neither eggs nor winged individuals of either sex were obtained. So far I have observed no serious injury to carrots or salsify by reason of the attacks of these insects.—[F. M. Webster, February 15, 1890.

MORE INSECTS INJURING THE TEA-PLANT IN CEYLON.

Mr. E. Ernest Green, of Eton, Punduloya, Ceylon, has sent us the continuation of the articles which he is publishing in the Ceylon Independent upon the above subject. The first nine installments are reviewed upon pages 192–193 of No. 6 of the current volume of INSECT LIFE. The additional insects treated are as follows:

The Tea Aphis (*Aphis* sp.): This insect is a much darker species than the one which occurs upon coffee, and frequently damages seedling plants in the nurseries and the young shoots first thrown out after pruning. The remedies recommended are kerosene emulsion, 1 part to 80 parts of water; phenyle, 1 part to 240 parts of water. The natural enemies mentioned are: Syrphid flies, Chrysopus, Lady-birds, a wasp of the genus *Rhopalum*, and an Aphidiid parasite.

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* INSECT LIFE, Vol. I, p. 362.

The Dipterous Leaf-miner (*Oscinis* sp.): This insect is so common that it is difficult to find a single tea bush upon which are not a great many leaves marked with the remains of its larva. An internal parasite is mentioned, and it is stated that this miner causes no appreciable damage.

The Black Grub or Cut-Worm (*Agrotis suffusa*): The full-grown larva of this insect shears off a number of young plants at each meal.

The Tineid Leaf-miner (*Gracillaria* sp.): This insect affects the younger leaves only, and has no opportunity of troubling where the bushes are regularly picked.

The Blue striped Nettle-grub (*Parasa lepida*): This is one of the stinging caterpillars, of which we have a number in this country, and it occurs in considerable numbers on the tea plantations, often completely defoliating the trees. The larva is of a brilliant yellow-green color with a rich lilac stripe along the middle of the back and a bright blue stripe on each side. The poisonous spines are pale green and are arranged in tufts along the body. The moth is chocolate brown, with a bright green band obliquing across the fore wings; the hind wings are buff, tinged with chocolate at the margins.

NEW INSECT LEGISLATION.

As exhibiting the lively legislative interest taken in California in regard to insect pests, and as supplementary to the Amended California Horticultural Laws published on pages 81 to 83 of the present volume, we give below a copy of Ordinance No. 26 of San Bernardino County, Cal., which was passed last November.

SECTION 1. No person or persons, either as owner, agent, servant or employé, shall *keep, sell, expose for sale or otherwise distribute* within the limits of San Bernardino, County, California, any fruits, plants, flowers or vegetables infected with live scale or other insects, or their eggs, larvæ or pupæ, detrimental or injurious to fruit-trees or plant-life, or the products thereof, and if any fruits, plants, flowers, or vegetables should, on examination, be found to be infected with scale or other insects, or their eggs, larvæ or pupæ, the said fruits, plants, flowers or vegetables shall be *disinfected or destroyed* under the direction of the county board of horticultural commissioners.

SEC. 2. No person or persons, whether as owner, agent, servant or employé, shall bring, or cause to be brought into the county of San Bernardino, any trees, vines, shrubs, scions, cuttings, grafts, plants, flowers, or vegetables from any district, county, or State declared by the county board of horticultural commissioners of said San Bernardino County to be infested with scale or other insects, detrimental or injurious to trees, vines, fruits or plant-life or the products thereof.

SEC. 3. No person or persons, as owner, agent, or employé, shall bring, or cause to be brought, into San Bernardino County, California, any trees, vines, shrubs, scions, cuttings, grafts, fruits, plants, flowers, or vegetables, from any district, county or State, *not* declared to be infested, as provided in section two of this ordinance, *without giving notice of their arrival to a member of the county board of horticultural commissioners or the local inspector of the district into which they are brought;* or plant, sell, give away or otherwise distribute them, or cause the same to be done, *until they shall first have been inspected*, and, if necessary, disinfected to the satisfaction of the county board of horticultural commissioners of said San Bernardino County.

[The board respectfully point out to the ladies of the county that the danger of bringing the scale on bouquets and small packages of potted plants, cuttings, etc., from infested districts is as great as from larger packages of trees, shrubs, etc., and ask a hearty compliance on their part with the above.]

SEC. 4. Every owner, or owners, or person or persons, in charge or possession of any orchard, nursery, or other premises in San Bernardino County, on which are growing any trees, vines, shrubs, plants, vegetables, or flowers infected with red or cottony cushion scale, or the eggs, larvæ or pupæ thereof, *shall, when required by the county board of horticultural commissioners*, as in their discretion may seem necessary, *cut back and disinfect* said infested trees, vines, shrubs, plants, vegetables, or flowers to the satisfaction of said board, or dig out and destroy the same as said board may direct.

[From observation and experience so far gained, the board are convinced that the most successful and cheapest method of treatment of the above-mentioned scale is by cutting back and defoliating the tree so that it may be thoroughly scrubbed in every part, subsequently spraying it and the surrounding trees.]

SEC. 5. Any person or persons who shall ship or bring, or cause to be shipped or brought into San Bernardino County, any trees, vines, scions, cuttings, grafts, shrubs, plants, vegetables or flowers, *shall have placed upon or securely attached to each box, package, or separate parcel* of such trees, vines, scions, cuttings, grafts, shrubs, plants, vegetables, or flowers, a distinct mark or label, showing the name of the owner or shipper, and the locality where produced.

[The attention of purchasers and nurserymen is particularly called to this section, and a strict compliance with its provisions will greatly facilitate the work of the board in determining infested districts.]

SEC. 6. The county board of horticultural commissioners shall from time to time, as in their discretion may seem necessary by publication in a newspaper of general circulation published in the county, publish a list of the districts, counties, or States which they declare to be infested for the purpose of this ordinance.

[The board will, as soon as they can obtain the necessary information, publish a list of the districts which they declare to be infested. In the meantime they would urge all persons to refrain from purchasing any trees, etc., from Los Angeles or Orange Counties.]

SEC. 7. Any person violating any of the provisions of this ordinance is punishable by imprisonment in the county jail not less than ten days, and not more than one hundred days, or by a fine not less than ten dollars nor more than one hundred dollars, or both. A judgment that the defendant pay a fine may also direct that he be imprisoned until the fine be satisfied, specifying the extent of imprisonment, which must not exceed one day for every dollar of the fine.

SEC. 8. This ordinance shall take effect and be in force on and after the first day of November, 1889.

A TEST CASE UNDER THE HORTICULTURAL LAW.

Some time during January the Los Angeles county horticultural commission secured the arrest of a fruit-grower who refused to destroy the scale insects upon his trees; and we learn from Mr. Coquillett that the trial has recently taken place, and that it resulted in the acquittal of the individual after the jury had been out but five minutes. The culprit pleaded many extenuating circumstances, and the sympathy of his neighbors was evidently on his side. The prevailing sentiment of the fruit-growers of Los Angeles County is that they are abundantly able to take care of their own trees, and they are strenuously opposed to any dictation as to when they should spray and what they should spray with.

LOCUSTS IN INDIA.

The occurrence in 1889 of swarms of locusts in Northwest India is taken advantage of by Mr. E. C. Cotes, of the Indian Museum, of Calcutta, to elucidate several doubtful points in the history of these destructive insects for a complete report which is being prepared under the direction of the trustees of the Indian Museum. To this end a circular, copies of which we have just received, has been distributed in the regions likely to be overrun, giving, in brief, accounts of the more destructive of the recent locust invasions.

There is some doubt as to the species of locust which invades India, and it is to settle this point and also to determine the distribution and the limits of the permanent breeding grounds that the circulars have been sent out. The locust generally referred to in India is *Acridium peregrinum*, supposed to be the locust of the Bible, but it seems probable that a second species is responsible for the invasion of Madras in 1878 and Deccan in 1882–'83, while the first-named species extends its ravages rather into the dry plains of the Punjab and Rajputana.

The circular gives the life-history and habits of the locusts, together with short accounts of the remedies that have been employed against them. The latter chiefly consist in the destruction of the eggs by plowing, and of the newly hatched locusts by driving them into ditches, where they are covered with earth. The screen system successfully employed against the locusts in Cyprus and Algeria is also described. The winged locusts have been destroyed by driving them into lines of burning straw. We shall look for the full report with considerable interest.

NEW INJURIOUS INSECTS IN COLORADO.

The list of injurious insects of Colorado has recently been augmented by the discovery of three beetles, at Denver, by Mr. H. G. Smith, jr., viz, *Bruchus obsoletus*, var. *fabæ* Riley, *Lachnosterna fusca*, and *Tenebrio obscurus*. Specimens of all of these have been seen by me. The two latter species have been verified by Dr. Horn.—[T. D. A. Cockerell, West Cliffe, Colo., March 3, 1890.

OBITUARY.

The *Entomologists' Monthly Magazine* announces the death, in its February number, of Prof. Heinrich Frey, of Zurich, from apoplexy, on the 17th of January, 1890. The death of Monsieur Lucien Buquet, who was treasurer of the Entomological Society of France for forty-five years (1842 to 1887), is also announced as having occurred the middle of December, 1889. He was appointed honorary treasurer of the French Society on his retirement, in 1887, and published many notes on Coleoptera in the "Annales."

AN ICERYA IN FLORIDA.

Passed Assistant Paymaster H. R. Smith, U. S. N., now stationed at Key West, Fla., sent to this Department on the 24th of March a bark-louse infesting the Rose. April 12th he sent further specimens, including a complete plant and all stages of the insect, except the male. We have recognized in this insect what seems to be a new species of the genus *Icerya*, but which resembles more closely *Icerya sacchari*—the sugar-cane pest of Mauritius—than *I. purchasi*, the citrus pest of California. The young lice are indistinguishable from *I. purchasi*, but the adult females lack the fluted ovisac and the glassy filaments. They are covered with white meal-like wax, and when this is removed they show the contrasting colors of black and red. The black is upon the dorsum of the thorax, and the red is upon the entire ventral surface and the dorsum of the abdomen. The younger stages are entirely red. The antennæ in the different stages are almost indistinguishable from those of *I. purchasi;* the mentum and rostrum are present, and the genito-anal ring lacks bristles. The second stage of the larva possesses not only the six long anal bristles, but has a row of very long bristles on the lateral border of the abdomen. While it is somewhat unsafe to generically refer a Monophlœbid without the male, we hope soon to get this, and will then endeavor to fully characterize and illustrate the species in a near number of INSECT LIFE. Meanwhile, we would propose for it the MS. name *Icerya rosæ.*

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

March 6, 1890.—Mr. Schwarz exhibited and remarked upon the following species of Coleoptera, which are new to the fauna of North America: *Lathridius* (*Coninomus*) *nodifer* Westwood; *Actinopteryx fucicola* Allibert, *Arrhipis lanieri* Guérin, and *Probatius umbratilis* Duval. He also showed specimens of *Temnochila hubbardi* Léveillé, and *Teretriosoma hornii* Lewis, recently described in European journals, from the semi-tropical region of Florida. He finally drew attention to Dr. Horn's recent revision of the North American species of *Ochthebius*, and spoke of the geographical distribution of these aquatic beetles.

Mr. Marlatt presented a note on a dipterous larva infesting the seeds of *Xanthium*. He had found these larvæ at Manhattan, Kans., and, during the past winter, in the District. Drawings were exhibited illustrating the larva and the nature of its work.

He also presented a short note on the food-habits of *Psiloptera drummondi*.

These notes were discussed by Messrs. Schwarz, Townsend, and Howard.

Mr. Townsend read a paper entitled "Notes on Acridiidæ in Michigan," which related more particularly to dates of appearance and habits.

C. L. MARLATT,
Recording Secretary.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF ENTOMOLOGY.

PERIODICAL BULLETIN. (Double number.) May and June, 1890.

Vol. II. Nos. 11 and 12.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE.

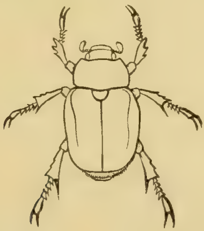
EDITED BY

C. V. RILEY, Entomologist,

AND

L. O. HOWARD, First Assistant,

WITH THE ASSISTANCE OF OTHER MEMBERS OF THE DIVISIONAL FORCE.



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SPECIAL NOTES.

Bibliography of American Economic Entomology.*—We are pleased to be able to announce that Parts I, II, and III of the Bibliography of the more important contributions to American Economic Entomology, by Samuel Henshaw, were published April 7, and are now ready for distribution. The larger share of the edition has been published under four covers, as follows: (1) Part I, the more important writings of Benjamin Dann Walsh, a pamphlet of 49 pages and 385 titles; (2) Part II, the more important writings of B. D. Walsh and C. V. Riley, comprising 46 pages and 478 titles; (3) Part III, the more important writings of Charles Valentine Riley, covering 276 pages and including 1,555 titles; and (4) an index to the first three parts, covering 83 pages and including, besides the general index, systematic indices of the new names proposed by both writers. The remainder of the edition has been published in one volume, cloth bound. We take this occasion to state that although Professor Riley has been greatly interested in the plan and has actively promoted the preparation of the general Bibliography, he is not at all responsible for the present publication, which was decided upon and the proof read during his absence in Paris last summer.

Subsequent parts of the bibliography will include the references to the economic writings of other American entomologists, and its completion is now only a matter of a very few months. Mr. Henshaw has been engaged upon this task for several years and his work has been well and carefully done. We hope that working entomologists will find this volume of assistance in lightening their labors in necessary bibliographical research, and we know from our own experience that the completion of the entire work will result in a great saving of time to investigators.—L. O. H.

* Bibliography of the more important contributions to American Economic Entomology. Prepared, by authority of the Secretary of Agriculture, by Samuel Henshaw. Parts I, II, and III. The more important writings of Benjamin Dann Walsh and Charles Valentine Riley. Washington: 1890.

Bulletin No. 21, Division of Entomology.*—Under this serial number Mr. Koebele's report on his trip to Australia and New Zealand to investigate the natural enemies of *Icerya purchasi* has recently been published. The bulletin is a narrative account and is plain and circumstantial. It is devoted almost entirely to the subject of his quest, but incidentally mentions some of the insect pests to Australian agriculture. Among these are *Otiorhynchus cribricollis*, a common south European Snout-beetle which has been imported into Australia, and is injurious to the Olive; *Aspidiotus rossi* Crawford, a Bark-louse injuring a variety of shrubs, including the olive tree; the Woolly Apple-louse (*Schizoneura lanigera*) probably introduced from this country; *Chortologa australis*, Sauss. MS., a destructive migratory locust which in South Australia takes the place of our *Melanoplus spretus*; the Black Scale (*Lecanium oleæ*), probably introduced direct from Europe on the Olive; several scale-insects of the subfamily *Monophlœbinæ*, injurious to the Eucalyptus; *Mictis profana* Fab. and a new species of *Aspongopus*—two Heteropterous insects injurious to the Orange—and three species of *Melolonthid* beetles injurious in the larval state to wheat crops. These are: *Scitala nigrolineata* Boisd., *S. pruinosa* Dalm., and *Anodontonyx vigilans* Sharp, the latter described in the last number of INSECT LIFE, page 302. The beetles were determined for us by Dr. David Sharp, of England, and the migratory grasshopper by M. Henri de Saussure, of Geneva. We have illustrated the report with 16 figures, 11 of which are new.

Recent important Entomological Reports.—Mr. Fletcher's report as entomologist of the experimental farms of Canada for 1889 reached us April 14† from Canada. He has some 30 pages of interesting matter illustrated with a dozen cuts. The principal articles concern the Hessian Fly, the Grain Aphis, the "Wheat Stem-maggot" (better known as the American Meromyza), Cut-Worms, Mediterranean Flour-moth, Granary Weevils, Spraying with Arsenites, Fuller's Rose-beetle, and a curious account of insects injuring a wooden water pipe. The principal points brought out are the facts that the Meromyza breeds freely in several kinds of grasses, the suggestion that an early sown strip of wheat or barley may be used as a trap for the same insect, and an indorsement of the poison trap remedy for Cut-Worms.

Prof. J. B. Smith has favored us with his bulletin on the insects injuriously affecting Cranberries in New Jersey.‡ He gives full illustra-

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*U. S. Department of Agriculture. Division of Entomology. Bulletin No 21. (Revised Edition.) Report of a Trip to Australia made under direction of the Entomologist to investigate the Natural Enemies of the Fluted Scale, by Albert Koebele. (Published by authority of the Secretary of Agriculture.) Washington: 1890.

†Experimental Farms. Reports of the Director, Chemist, Entomologist and Botanist, Horticulturist, Poultry Manager, and Superintendents Experimental Farms, for 1889. Ottawa. 1890.

‡Special Bulletin New Jersey Agricultural College Experiment Station, K, February 28, 1890.

tions and accounts of the Black-headed Cranberry-worm (*Rhophobota vacciniana*), the Cranberry Fruit-worm (*Acrobasis vaccinii*), the Tip Worm (*Cecidomyia vaccinii*), the Cranberry Scale (*Aspidiotus* sp.), Grasshoppers and Locusts and Cranberry Leaf-hoppers. The principal pests are the two first mentioned, and for the first he recommends reflowing, kerosene, and Paris green. For the second he advises an application of Paris green or London purple after all the blossoms are off, or nearly all of them, and the berries are generally set. He follows Professor Fernald in considering *Teras oxycoccana* Pack. as distinct from *T. vacciniana*, though our own conclusions as to the synonymy were based on a specimen of the former determined by Dr. Packard.

Miss Ormerod's report for 1889* reached us during April. The leading article of the report is a consideration of the disease known as clover sickness, produced mainly by an Anguillulid—*Tylenchus devastatrix*. Several measures of prevention and remedy are pointed out, viz, rotation of crops, a dressing of gas lime, avoidance of the use of dung from infested clover or oats, the application of sulphates and deep plowing. The Clover-root Cecidomyia is mentioned and some consideration is given to Millipedes, Clover and Pea Weevils, the Hessian Fly, two species of Oscinidæ, the Wheat Bulb-fly (*Hylemia coarctata*), the Currant Gall mite, the White Currant-scale (*Pulvinaria ribesiæ*), the Mediterranean Flour-moth, the Wheat Fly, and certain orchard insects and a few species injurious to Pine, Plum, and Turnip, together with some further notes on Ox Warbles, repeating her statements regarding "licked beef" and "jelly," reviewed in No. 5 of the current volume of INSECT LIFE and adding further statistics from correspondents. There is an appendix upon *Xyleborus dispar* in which the use of trap wood is recommended and Eichoff's work on Bark-beetles is quoted at length, particularly with reference to the food of the larvæ, a subject which we touched upon on pages 279–280, No. 9 of this volume.

We have just received from Professor Forbes his fourth and fifth reports as State Entomologist of Illinois.† These reports although greatly delayed are none the less welcome. On account of the delay Professor Forbes has been obliged to withdraw several articles already prepared upon subjects which more recent observations will enable him to treat better hereafter.

The fourth report includes articles upon arsenical poisons for the Codling Moth, in which the conclusion is reached that 70 per cent. of the

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* Report of Observations on Injurious Insects and Common Farm Pests during the year 1889, with methods of prevention and remedy. 13th Report, by Eleanor A. Ormerod. London, 1890. Price 18*d*.

† Fifteenth Report State Entomologist on the Noxious and Beneficial Insects of the State of Illinois. Fourth Report S. A. Forbes; for the years 1885 and 1886. Springfield, 1889.

Sixteenth Report State Entomologist on the Noxious and Beneficial Insects of the State of Illinois. Fifth Report S. A. Forbes; for the years 1887 and 1888. Springfield, 1890.

crop can be saved by spraying; a second contribution to the knowledge of the life history of the Hessian fly, indicating that the development of a third brood of larvæ may sometimes detract from the effect of late sowing; the life history of the "Wheat Bulb-worm" (the American Meromyza) showing three broods in Illinois; Mr. Weed's article upon an outbreak of injurious locusts in Illinois (the same paper as read before the Society for the Promotion of Agricultural Science in 1888) and an article by the same author upon some common insects affecting the foliage of young Apple trees in the nursery and the orchard. There is an appendix by Professor Forbes on the present condition and prospects of the Chinch Bug in Illinois which was summarized on page 222 of Vol. I of INSECT LIFE. The only illustrated article is that by Mr. Weed upon Apple insects.

The fifth report is more extensive, covering 104 pages and includes three chief articles, viz: Studies on the Chinch Bug, II, the Corn Bill-bugs, and Notes on Cut Worms. The report is illustrated by six beautiful heliotype plates, two and one-half devoted to Bill Bugs, and the others to Cut Worms, the Wheat Thrips, and the Burrowing Web-worm (*Pseudanaphora arcanella*). Professor Forbes gives an excellent account of former observations upon the species of Sphenophorus, ordinarily known as Bill Bugs. As an appendix to the report, an extensive analytic economic bibliography of the Chinch Bug from 1875 to 1888 is given, covering one hundred and twenty-two pages. It seems to be as full and complete as great pains can make it.

Mr. Whitehead's third annual report* has also just been published. It includes a consideration of some thirty topics, several of which are also considered in Miss Ormerod's report. The articles are all short, nearly all are illustrated, and though containing little that is original, the report, as a whole, is well adapted to the use of British farmers and gardeners.

Work at the Cornell Station.—Professor Comstock, in Bulletin 15 of the Cornell Agricultural Experiment Station, December, 1889, entitled "Sundry investigations made during the year," gives an account of the Apple-tree Tent-caterpillar (*Clisiocampa americana*). Though this is a well-known insect, yet, on account of its great increase of late years as a pest, a brief restatement of its habits is not at all out of place.

In the second annual report of the Station, for the year 1889, Professor Comstock presents an outline of his work as entomologist for the year. The Wheat Saw-fly (*Cephus pygmæus*) has been studied and the "clematis disease" has been determined to be due to *Heterodera radicicola*, the same Nematode worm, of the family Anguillulidæ, which

*Third Annual Report on Insects and Fungi injurious to the Crops of the Farm, the Orchard, and the Garden, by Charles Whitehead, esq., F. L. S., F. G. S., 1889, London. 1890. Printed for Her Majesty's stationery office by Eyre & Spottiswood, printers to the Queen's most excellent Majesty.

is the subject of Professor Atkinson's Bulletin No. 9 of the Alabama Agricultural Experiment Station, recently noticed in these pages.

A series of field experiments is proposed by Professor Comstock the present year to determine the best method of combating it. Work has also been prosecuted on wire-worms; a hop-yard has been established for the study of the Hop Aphis; and much attention has been given to a species of Aleurodes (*A. vaporiorum*) which infests in its early stage the under side of the leaves of various plants and has not before been mentioned as occurring in this country, although it is a well-known European pest.

Ohio Station Investigations.—Article XIX in Bulletin 7, volume II (Second Series, No. 14) of the Ohio Agricultural Experiment Station, entitled "Notes on Experiments with Remedies for certain Diseases," by Clarence M. Weed, is interesting as treating of the matter of combining insecticides and fungicides, or applying at the same time a remedy to destroy fungus diseases as well as insects. Mr. Weed states that the practicable application of such a combination originated in the division of entomology and botany of the Ohio Station. The case is well set forth in the article, by an extract from a recent paper by Mr. Weed in *Agricultural Science* (date not given). It is proposed that by combining the copper sulphate solution for blight and the Paris green or London purple solution for the Colorado Potato-beetle, a solution can be made that at the same application will kill both, and lessen the expenditure of time and labor. In the same way a vineyard may be protected from black rot and various leaf-eating beetles by combining such applications as are used for each. A note on the efficacy of "eau celeste" for mildew and the Rose Beetle was published in INSECT LIFE for July, 1888 (Vol. I, p. 32), and we may add that combined applications for insects and fungi have long been made in France.

A résumé of the principal injurious insects noticed by the Ohio Agricultural Experiment Station during the year 1889 is given in the Eighth Annual Report, published in Bulletin 8, Volume II, second series, of the Station. Two insects that gained prominence during the year are the Grain Plant-louse and the White Grub. An original figure of the wingless form of the former is given, and its great abundance in June and sudden decrease from the attacks of Lady-birds and Hymenopterous parasites are noticed.

A new remedy is claimed for the Clover-seed Midge (*Cecidomyia leguminicola*), which consists in mowing the field about the middle of May when the heads are just forming. The new crop of blossoms following matures between the two broods of the midge, thereby escaping. This is but a variation of a remedy originally proposed by Professor Comstock in the Annual Report of this Department for 1879, page 195, and reproposed by Mr. James Fletcher in 1887.

Four clover insects additional to Mr. Weed's recent list are given. These are two butterflies (*Cyaniris pseudargiolus* and *Epargyreus tityrus*) and two plant-lice (*Aphis trifolii* and *Callipterus trifolii*). Successful spraying with arsenites has been carried on against the Plum Curculio and the Codling Moth.

Original figures are given of a Sphinx larva covered with *Apanteles* cocoons, the green Apple Leaf-hopper (*Empoasca albopicta*), the Rose Leaf-hopper (*Typhlocyba rosæ*) and *Belostoma americanum.*

A method is set forth for covering cucumber vines with a gauze-covered frame to protect them from the Striped Beetle (*Diabrotica vittata*). The Bean Weevil (*Bruchus obsoletus*), Pear or Cherry-tree Slug, Imported Cabbage-worm (*Pieris rapæ*), and Strawberry Root-louse (*Aphis forbesi*) are also treated.

Professor Westwood's Revision of the Mantidæ.—The veteran entomologist, Professor Westwood, has just issued a monumental work on the curious insects of this Orthopterous family, which is entitled "Revisio Insectorum Familiæ Mantidarum, Speciebus novis aut minus cognitis descriptis et delineatis." It consists of a synonymical and bibliographical list of the species of the family, full descriptions of one hundred and eight new or little known species, a bibliography of the family, and an alphabetical index of the genera, species, and synonyms. There are fourteen magnificent quarto lithographic plates drawn by the author, comprising figures of one hundred and twenty-seven different forms. Professor Westwood's record has seldom, if ever, been approached among entomological workers. Since 1827 he has constantly been publishing valuable contributions to our science, and now at the age of eighty-four to bring out a work of this character is an event probably beyond precedent.

Of the five hundred and thirty-two species catalogued for the whole world but twelve are found in America north of Mexico. These are the following:

Gonatista grisea Fabr.
Oligonyx uhleri Stål.
Oligonyx scudderi Sauss.
Oligonyx graminis Scudd.
Thesprotia baculina Bates MS.
? *Sphendale infuscata* Sauss.
? *Phasmomantis grandis* Sauss.
Mantis wheeleri Wheeler.
Stagmomantis carolina Johanson.
Stagmomantis dimidiata Burm.
Stagmomantis ? *minor* Scudd.
Pseudovates mexicana Sauss.

Another new entomological Journal.—We have just received the first number of Volume I of the "*Entomological Record and Journal of Variation,*" edited by J. W. Tutt, F. E. S., and published by W. H. Allen & Co., of London. This first number relates exclusively to Lepidoptera, but in the prospectus we notice no mention of an intentional restriction to this order. The magazine will be devoted to the wants of English entomologists and restricted to their own fauna and such parts of for-

eign entomology as they need in the understanding of the British species. The subject of variation will occupy a leading position.

The principal article in the first number is upon the genus "Acronycta and its Allies," by Dr. T. A. Chapman, and is followed by a general consideration of "Melanism and Melanochroism in British Lepidoptera," by Mr. Tutt, who agrees with Mr. Cockerell in considering that melanism depends largely upon humidity for its occurrence. "Notes on Collecting" bring out several interesting points, and the editor contributes some good "Practical Hints" regarding the breeding of rare species.

A necrophagous Dipteron.—In the present number we publish an article by Mr. Webster upon certain flies found infesting a human corpse in Indiana, and under "Extracts from Correspondence" some correspondence upon the general subject as well as upon this particular instance, which will supplement his communication. We had hoped to introduce figures of the species sent by Mr. Webster (*Conicera* sp.), but must defer them for a near number of INSECT LIFE.

Florida Orange Scales in California.—The fruit-growers of California are just at present very much disturbed over the importation of fruit trees from Florida which are infested with several scale-insects which have not before been prevalent in the former State. Among these are the Long Scale (*Mytilaspis gloverii*), the Purple Scale (*M. citricola*), and the Chaff Scale (*Parlatoria pergandii*). The May number of the *Rural Californian* is largely occupied with discussions of the probable damage which will be done by these pests and the necessity for a rigid quarantine. We have received a number of letters also from California asking our opinion and have replied that while there seems reason to believe, and we are inclined to believe, from the evidence at hand, that the scales above mentioned will not flourish in certain parts of southern California like Riverside where the heat and dryness are great, yet it will be unwise to depend too much on the limited experience of the past. We have therefore reiterated our conviction as to the necessity of using every precaution to prevent their introduction.

One pertinent editorial paragraph in the journal referred to strikes us as worthy of quotation:

> There seems to be a feeling awakened that the times of political entomologists are over, and that in the future men who are versed in the science of entomology are only to be appointed to positions requiring some knowledge of that study.

California has taken hold of the subject of insect pests with considerable energy; but, as was to be expected from the number of official positions created, "political entomologists" have been called into existence

and the State has suffered from them. Much has been done in the way of county regulations and State laws governing inspection, quarantining, and disinfection, and in many instances these regulations have accomplished a great deal of good. We anticipated this scare about Florida scales and placed ourselves upon record some time ago as to the necessity of the establishment of a quarantine in Florida against infested plants from California and *vice versa.*

THE INSECT COLLECTION OF A LARGE MUSEUM.*

By C. V. Riley.

THE TYPE OR SYSTEMATIC COLLECTION.

The ideal *cabinet* collection of a National Museum should represent, as completely as possible, the insect fauna of the country, properly classified and determined. It can, necessarily, have little interest for the public at large and should be consecrated to the use of the specialist and to the advancement of the science of entomology. For this purpose it should be most carefully guarded and conserved in the best-made drawers and cases and secured alike from light and the too constant handling of the mere curious. It should constitute a study collection to which workers are drawn for unpublished facts and for comparisons and determinations. It should be so well conserved and provided for as to induce describers of new species to add to it their types or authentic duplicates thereof. It will be many years ere such an ideal collection can be gotten together, and none now living may witness it, but the material now on hand forms a good foundation for it.

THE EXHIBIT COLLECTION.

The *exhibit* collection should be something entirely independent and apart from the other, and, on account of the rapid deterioration of insect specimens constantly on exhibition and necessarily much exposed to light, should consist, as far as possible, of duplicates only, or of such commoner species as can be easily replaced. Intended for the instruction and edification of the lay visitor to the Museum, it should illustrate in the boldest possible way the salient characters of the class, the larger classificatory divisions and the structures on which they are based, and the wonderful metamorphoses and economies of the commoner and easily recognized species, particularly in their relations to man either directly or indirectly through injury or benefit.

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*Extracted, with slight changes, from the Annual Report of the Smithsonian Institution for 1886, Part II, Report of the National Museum, pp. 182–186, Washington, 1890.

The value of such an exhibit collection depends very much on conspicuity, and this can best be obtained by the liberal use of diagrams and enlarged drawings, as the majority of the most interesting species and those which most concern man are almost microscopic in size. Such an exhibit collection will miss its mark and object whenever it exceeds these limits, and by too much detail seeks to interest and instruct the specialist or in other ways trenches on the function of the study collection. As the Museum, in this department, will, in accordance with statute (Revised Statutes, sec. 5586), receive a great deal of its best material through the Department of Agriculture, one of the chief aims of this national collection should be to reciprocate, not only by preserving all systematic material and thus aiding said Department of Agriculture in necessary determinations, but by giving particular attention to the biological side of the collection. This I have endeavored to do, and the collections illustrating the biology of North American insects are the largest in the world.

DRAWERS AND CASES.

The character of the drawers and cabinets employed in such a national collection is important; for upon it the future preservation of specimens very greatly depends. Knowing it to be Professor Goode's desire to adapt, as far as possible, the drawers used in all departments to the unit size which he has adopted for the Museum, some effort was made in this direction; but the adaptation, while possible for the exhibit collection, was found impracticable, or at least very undesirable, for the study collection. Hence, after carefully studying, in person, the different forms and patterns used for entomological collections both in this country and Europe, whether by private individuals or public institutions, I have adopted a drawer and cabinet essentially after the pattern of those used in the British (South Kensington) Museum, but best adapted in size to our own requirements or conception. The drawers are square, with an outside measurement of 18 inches and an outside depth of 3 inches. The sides and back have a thickness of three-eighths of an inch, while the front is five-eighths of an inch thick. The pieces are firmly dove-tailed together, the front being clean and the dove-tailing blind. The bottom is of three-ply cross-grained veneer, run into a groove at the sides, leaving a clear inside depth of $2\frac{1}{16}$ inches to the frame of the cover. The bottoms are lined in all but forty of the drawers with first quality cork one-fourth of an inch thick. At a distance of one-fourth of an inch from the sides and back and three-eighths of an inch from the front there is an inside box of one-eighth inch whitewood closely fitted, and held in place by blocks between it and the outer box. There is thus between the inner and outer box a clear space all round, in which insecticides or disinfectants can be placed to keep out Museum pests, and making it impossible for such to get into the inner box containing the specimens without first passing through this poison chamber.

The entire inside is lined with white paper, or, in the case of the uncorked boxes, painted with zinc-white. The front is furnished with a plain knob. The cover is of glass, set into a frame three-fourths of an inch wide, three-eighths of an inch thick, with a one-fourth-inch tongue fitting closely into the space between the inner lining and outer box, which here serves as a groove. This arrangement furnishes a perfectly tight drawer of convenient size, and not unwieldly for handling when studying the collection.

The material of which these drawers are made is California redwood, except the cover frame, which is mahogany. The cabinets containing these drawers are 36 inches high, 40 inches wide, 21 inches deep (all outside measurements), and are closed by two paneled doors. Each cabinet contains twenty drawers in two rows of ten each, and the drawers slide, by means of a groove on either side, onto hard-wood tongues, and are designed to be interchangeable. * * *

The bulk of the collection is still contained in small folding boxes which are admirably suited for containing a working collection, especially of those orders comprising smaller insects like Coleoptera, Hymenoptera, etc. These folding boxes have the great advantage of being readily re-arranged upon shelves and of being very easily used in study.

The folding boxes finally adopted are of white pine, shellacked and varnished, the bottom and top double, and cross-grained to prevent warping. They are 13 by 8¼ inches outside measurement, the top and bottom projecting slightly at the front and sides. The inside measurement is 11¾ by 7. The sides, back, and front are five-sixteenths of an inch thick, with a machine joint, which is neat and very secure. The boxes are 2⅝ inches in outside depth, unequally divided, the lower portion 1½ inches outside depth, lined inside with a thin whitewood strip, projecting three fourths of an inch above the rim of the outside box. Over this projecting lining the lid closes as tightly as practicable and is kept from springing by hooks and eyes. The bottom is cork-lined and covered with a fine white glazed paper.

All the boxes are furnished with neat brass label holders into which a card containing a list of the contents can readily be placed and removed at pleasure. This general form of box has long been used by us and by other collectors, and the chief demerit which I have endeavored to overcome by the above details, is the tendency to warp and crack in the trying steam heat of our Government buildings.

ARRANGEMENT OF BIOLOGIC MATERIAL.

The biologic material is, very much of it, alcoholic; for though many of the immature states of insects may be preserved by dry processes, yet the bulk must needs be kept in liquid. Where the material is in duplicate it is well, when it is not too heavy or cumbersome, to place such biologic material with the systematic collection; yet experience has

taught that it is wiser to make a separate *biologic collection*, and this it is proposed to do. This collection will, in fact, be a feature of the Museum collection in the future. Hence it was very desirable to adopt some method of securing the vials in such a manner that they can easily be moved from one place to another, and fastened in the ordinary boxes and drawers employed for pinned insects. The vials in use to preserve such specimens as must be left in alcohol or other liquids are straight glass tubes of varying diameters and lengths with round bottom and smooth, even mouth. The stopples in use are of rubber, which, when tightly put into the vial, the air being nearly all expelled, keep the contents of the vial intact and safe for years.

Various forms of bottles are used in museums for the preservation of minute alcoholic material. I have tried the flattened and the square and have studied various other forms of these vials; but I am satisfied that those just described, which are in use by Dr. Hagen in the Cambridge Museum, are, all things considered, the most convenient and economical. A more difficult problem to solve was a convenient and satisfactory method of holding these vials and of fastening them into drawers or cases held at all angles, from perpendicular to horizontal. Most alcoholic collections are simply kept standing, either in tubes with broad bases or in tubes held in wooden or other receptacles; but for a biologic collection of insects something that could be used in connection with the pinned specimens and that could easily be removed, as above set forth, was desirable. After trying many different contrivances I finally prepared a block, with Mr. Hawley's assistance, which answers every purpose of simplicity, neatness, security, and convenience. It is, so far as I know, unique, and will be of advantage for the same purpose to other museums. Hence I have concluded in this report to give a brief description of it. It has been in use now for the past three years, and has been of great help and satisfaction in the arrangement and preservation of the alcoholic specimens.

The blocks are oblong, one-fourth of an inch thick, the ends (*c c*, fig. 66) beveled, the sides either beveled or straight, the latter preferable They vary in length and breadth, according to the different sizes of the vials, and are painted white. Upon the upper side of these blocks are fastened two curved clamps of music wire (*b b*), forming about two-thirds of a complete circle. The fastening to the block is simple and secure. A bit of the wire of proper length is first doubled and then, by a special contrivance, the two ends are bent around a mandrel so as to form an insertion point or loop. A brad-awl is used to make a slot in the block into which this loop is forced (*e*, fig. 66, 5), a drop of warm water being first put into the slot to soften the wood, which swells and closes so firmly around the wire that considerable force is required to pull it out. Four pointed wire nails (*d d d d*), set into the bottom so as to project about one-fourth inch, serve to hold the block to the cork bottom of the case or drawer in which it is to be placed. The method

of use is simple and readily seen from the accompanying figures, which represent the block from all sides.

The advantages of this system are the ease and security with which the block can be placed into or removed from a box; the ease with which a vial can be slipped into or removed from the wire clamps; the security with which it is held, and the fact that practically no part of the contents of the vial is obscured by the holder—the whole being visible from above.

The beveled ends of the block may be used for labeling, or pieces of clean card-board cut so as to project somewhat on all sides may be used for this purpose and will be held secure by the pins between the block and the cork of the drawers.

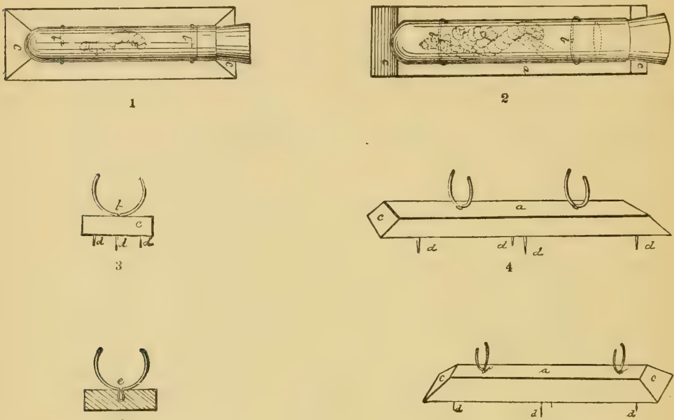

FIG. 66.—Vial-holder; 1, block, with vial beveled on all sides; 2, do. beveled only on ends; 3, block, end view; 5, do. section; 4, 6, do. side views; *a*, block; *b*, spring wire clamps; *c*, beveled ends of block; *d*, pointed wire nails; *e*, point of insertion of clamp (lettering on all figures corresponds.) After Riley.

NOTES ON LANGURIA.

By F. H. CHITTENDEN.

While on a collecting trip during June of last year I observed a specimen of that handsome little Erotylid beetle, *Languria mozardi* Latr. on a Composite plant, the daisy flea-bane—*Erigeron ramosus* Walt. (*strigosus* Muhl.)—the stem of which it was engaged in gnawing, having already cut with its mandibles a fair-sized hole preparatory to the deposition of its eggs.

In the account of the habits of this species published by Prof. J. H. Comstock in the Annual Report of the U. S. Department of Agriculture

for 1879 (p. 199) it is stated that "the adult beetles begin to issue in August and on continually, making their exits until late in October. There is probably only one brood in a season, and the insect hibernates in the beetle state. An examination of many stalks (clover) during the winter failed to show the insect in any stage of growth."

When reading this account I remembered having seen during the preceding summer a female *Languria mozardi* ovipositing in a common species of ragweed (*Ambrosia trifida*). A visit in the following November to the locality where this observation was made resulted in the discovery of facts that throw new light on the habits of these beetles. In the ragweed stems were found some half dozen specimens of larvæ, which, with the aid of the description and figure given in the article above referred to, I was enabled to identify as belonging to some species of the genus. Of these larvæ all but one agreed with the published description and were afterward found to be *L. mozardi.* One specimen, however, was larger than the others and differed in other respects from the description. This specimen transformed and proved to be *L. gracilis* Newm. The larvæ did not appear to be feeding on the fresh white pith, but rather in the dead and discolored pith. They have a habit of frequently doubling up, assuming a shape that may be represented by an interrogation point: . Possibly by thus doubling up they are enabled to crawl up and down in the nearly hollow stems in which they live. Part of the larvæ were kept till April of the ensuing year, proving that they hibernate in this as well as in the adult state.

Can it be said of these beetles as of Cerambycidæ and allied families that they are single-brooded or double-brooded? As is the case with many other Clavicorns they breed the year round and there does not appear to be a well-defined or limited number of broods.

I have frequently observed these species in June and July on the stems of a common nettle (*Urtica dioica*), *L. mozardi* occurring in greater abundance, often *in copula* or busied in gnawing holes in the stems.

To recapitulate, *L. mozardi* is known to breed in the stems of clover, and specimens of larvæ indistinguishable from that of *L. mozardi* as described (*l. c.*) are mentioned by Prof. F. M. Webster (Rept. U. S. Dept. Agr., 1886, p. 674) as infesting the stems of timothy. Both species breed in *Ambrosia*, and their occurrence under the circumstances above recorded on *Urtica* is sufficient evidence that both breed in the stems of this plant as well. The probable oviposition of *mozardi* in *Erigeron ramosus* points to this as a likely food-plant, and the occurrence of the same species on the common ox-eye daisy (*Chrysanthemum*), a near relative of *Erigeron*, would lead to the belief that another Composite plant might be included in the list.

The habits of the two species are very similar, if not identical, and further investigation may show that they breed in the stems of a still greater variety of plants. My observations tend to show that they favor the Compositæ.

SOME OF THE BRED PARASITIC HYMENOPTERA IN THE NATIONAL COLLECTION.

It is our intention, as fast as the material in the National Museum collection can be re-arranged, to record in a series of lists in consecutive numbers of INSECT LIFE the hosts, dates, and localities of those species of Parasitic Hymenoptera which have been reared. New species are indicated in MS names where preliminary descriptions, which we hope to revise and publish, have been drawn up.

The advantages of such lists to working entomologists are too obvious to require elaboration.

Family BRACONIDÆ.

Subfamily Braconinæ.

Parasites.	*Hosts.*
Bracon simplex Cress	*Cerambycid* (unbred) under bark of Oak. Washington, D. C. Collected also at St. Louis, Mo., and in Texas.
Bracon agrili Ashm	*Agrilus fulgens* Lec. under bark of maple. Lafayette, Ind., April 21 to May 4, 1887.
Bracon pectinator ? Say	*Saperda vestita* Say, on Elm ? Washington, D. C.
Bracon arizonensis Ashm	*Andricus coxii* Bass. Fort Grant, Ariz., March 28 to April 6, 1882.
Bracon solidaginis Riley MS	*Gelechia gallæsolidaginis* Riley. St. Louis, Mo., August, 1867.
Bracon atriceps Riley MS	*Laverna sp.?* on *Epilobium angustifolium*. Cadet, Mo., September 3, 1886.
Bracon cecidomyiæ Ashm	*Cecidomyiid* gall on *Mimulus glutinosus*. Alameda, Cal., Jan. 9, 1886.
Bracon nigripictus Riley MS	*Sannina exitiosa* Say. Washington, D. C., May 10 and June 4, 1879. *Dolba hylæus* Drury. St. Louis, Mo., October, 1870.
Bracon sp. ?	*Platynota flavedana* Clem., on Clover. Washington, D. C., September 3, 1879.
Bracon diastatæ Ashm	*Diastata* N. sp. mining leaves of corn. Jacksonville, Fla., June 28, 1886. Received also from La Fayette, Ind.
Bracon gastroideæ Ashm	*Gastroidea cyanea* Mels. Columbus, Ohio, June 7, 1886.
Bracon phycidis Riley MS	*Phycis indiginella* Zell. Oxford, Ind., July 9, 1886.
Bracon pissodis Ashm	*Pissodes strobi* Peck. on pine. Wellesley, Mass., August 19, 1886.
Bracon n. sp	*Ægeria exitiosa* Say. Kirkwood, Mo., November, 1872.

Parasites.	*Hosts.*
Bracon xanthostigma Cr.	*Botis penitalis* on Lotus. St. Louis, Mo., September 15, 1875.
	Tortricid gall on Goatweed. Woodburn, Ill., August 6, 1872.
	Gelechia beneficentella Murtf. from bolls of *Solanum carolinense*. Washington, D. C., June 30 to July 4, 1886.
	Gelechia cercidos Murtf. Kirkwood, Mo. Collected also in Texas.
Bracon n. sp.	*Trypeta gibba* Löw. gall on Ambrosia. La Fayette, Ind., May 3, 1889.
Bracon gracilariæ Ashm	*Gracilaria desmodiella* Chamb. Kirkwood, Mo., July 12, 1886.
Bracon bucculatricis Ashm	*Bucculatrix* n. sp. on oak. Kirkwood, Mo., June 10, 1886.
Bracon xanthonotus Ashm	Phalænid pupa on Orange. San Diego, Cal., December 18–20, 1876.
Bracon n. sp	*Clisiocampa constricta* Str. Sacramento, Cal., June 16 and 17, 1882.
Bracon n. sp.	*Proteoteras æsculana* Riley. Kirkwood, Mo.
Bracon californicus Riley MS.	*Cecidomyiid* gall on *Baccharis pilularis*. Alameda, Cal., February 19, 1886.
Bracon cookii Ashm	Leaf-miner on Basswood. Lansing, Mich.
Bracon notaticeps Ashm	Tineid leaf-skeletonizer on Oak. Washington, D. C., September 30, 1880.
Bracon gelechiæ Ashm	*Gelechia* sp. ? on Oak. Washington, D. C., October 5 and 6, 1880.
	Gelechia cinerella Murtf. Kirkwood, Mo., 1881.
Bracon n. sp.	*Gelechia roseosuffusella* Clem. St. Louis, Mo., May, 1872.
Bracon analcidis Ashm	*Analcis fragariæ* Riley. St. Louis, Mo., September, 1870.
Bracon vernoniæcola Ashm	Dipteron in seeds of *Vernonia*. Kirkwood, Mo., September 14, 1881.
Bracon vernoniæ Ashm	*Platynota sentana* Clem. and *Endemis botrana* Schiff. in seed capsules of *Vernonia noveboracensis*. Washington, D. C., May 15–18, 1885, and St. Louis. Mo., April 22.
Bracon junci Ashm	*Coleophora* ? on *Juncus balticus*. St. Louis, Mo., September 18, 1876.
Bracon juncicola Ashm	*Coleophora cispiticella* Walsingh. on *Juncus balticus*. St. Louis, Mo., September 11, 1876.
Bracon trifolii Ashm	*Coleophora* sp. ? on white clover. Washington, D. C., June 30, 1879.
Bracon tortricicola Ashm	Tortricid in seeds of *Ambrosia trifida*. Kirkwood, Mo., April 23, 1885.
Bracon euuræ Ashm	Galls of *Euura* on *Salix californica*. Donor P. O., Placer Co., Cal., January, 23, 1886.
Bracon juglandis Ashm	Tineid ? larva in walnuts. Los Angeles, Cal.
Bracon pomifoliellæ Ashm	*Bucculatrix pomifoliella*. St. Louis, Mo.

Parasites.	*Hosts.*
Bracon n. sp	*Rhyssematus lineaticollis* Say on *Asclepias corymbosa*. La Fayette, Ind., March 29, 1889.
Bracon n. sp	*Smicronyx tychioides* on *Cuscuta arvensis*. Washington, D. C., July 24, 1879.

Subfamily **Exothecinæ.**

Bathystomus n. sp	*Tortricid* leaf-roller on Oak. Los Angeles, Cal.
Rhysipolis orchesiæ Ashm	*Orchesia castanea* Melsh. in woody fungus. Grand Ledge, Mich., July 24, 1881.
Rhysipolis phoxopteridis Riley MS	*Phoxopteris nubeculana* Clem. on Apple. Kirkwood, Mo., May 5, 1884.

Subfamily **Spathiinæ.**

Spathius abdominalis Riley MS	*Phlœosinus dentatus* Say on Cedar. Salina, Kans., May 23, 1885.
Spathius sequoiæ Ashm	Coleopterous larva on Red Wood. Alameda, Cal.

Subfamily **Hecabolinæ.**

Cænophanes prodoxi Riley	*Prodoxus decipiens* Riley on Yucca. St. Louis, Mo.
Cænophanes hemiptychi Riley MS	*Hemiptychus punctatus* Lec., in Grape. Elizabeth, N. J., 1880.
Cænophanes koebelei Riley MS	*Prodoxus œnescens* Riley on Yucca. Los Angeles, Cal., June 5 to 9, 1886.
	Prodoxus n. sp. on *Yucca whipplei*. Los Angeles, Cal., January 6 to February 10, 1887.
	Pronuba n. sp. on Yucca. Los Angeles, Cal., September 15, 1886.
	Prodoxus marginatus Riley on *Yucca whipplei*. Los Angeles, Cal., May 22, 1886.
Cænophanes n. sp	*Laverna* n. sp. gall-moth on *Trichostomum dichotoma*. Georgiana, Fla., July 11, 1882.
	Gelechia gallæastrella Kellicott on *Aster asteroides*. Bladensburgh, Md., July 5, 1883.

Subfamily **Doryctinæ.**

Doryctes mellipes Ashm	Borer in rotten Cherry-wood. Kirkwood, Mo., April 27, 1888.

Subfamily **Rhyssalinæ.**

Rhyssalus atriceps Ashm	*Cacœcia rosaceana* Harr. on Apple. Washington, D. C., July 1, 1882, and August 15, 1886.
Rhyssalus loxotaeniæ Ashm	*Loxotaenia clemensiana* Fernald on wheat. La Fayette, Ind., June 3, 1885.

Parasites.	*Hosts.*
Rhyssalus n. sp	*Sarrothripa rewayana* Dup. on willow. Washington, D. C., July 22, 1886.
Rhyssalus selandriæ Ashm	*Eriocampa cerasi?* Peck. Washington, D. C., July 5, 1879.
Ryhssalus antispilæ Ashm	*Antispila ampelopsiella* Cham. on Grape. Kirkwood, Mo.
Rhyssalus trilineatus Ashm	*Coleophora caryæfoliella* Chamb. on Hickory. Washington, D. C., May 5, 1883.
Rhyssalus oscinidis Ashm	*Oscinis* sp. ? on *Plantago major.* Washington, D. C., July 6 to 9, 1888.
Rhyssalus californicus Ashm	Gall of *Holcaspis chrysolepsis* Ashm. on *Q. chrysolepis.* Colfax, Cal., December 19, 1885.
Rhyssalus gallicola Ashm	Gall of *Amphibolips trizonata* Ashm. on Oak. Fort Grant, Ariz., June 21 and 23, 1882.
	Gall of *Compsodryoxenus brunneus* Ashm. on Oak. Fort Grant, Ariz., April 27, 1882.
	Gall of *Callirhytes vacciniifolii?* Ashm. on Oak. Fort Grant, Ariz., April 21, 1882.
Colastes microrhopalæ Riley MS.	*Microrhopala vittata* Fab. on different species of Solidago. Washington, D. C., June 21, 1884.
? Colastes	*Gossyparia ulmi* Geoffr. Rye, N. Y., June 23, 1884.
Oncophanes melleus Ashm	Microlepidopterous ? larva on Oak. Kirkwood, Mo., August 24, 1884.

Subfamily Rhogadinæ.

Heterogamus fumipennis Cr	*Sphinx drupiferarum?* Abb. on Apple. St. Louis, Mo., May 10, 1868.
	Smerinthus juglandis. Abb. St. Louis, Mo., July 15, 1873.
Heterogamus texanus Cr	*Ceratomia amyntor* Hb. ? on Elm. Lansing, Mich., June 18, 1887.
Rhogas terminalis Cr	*Leucania unipuncta* Haw. St. Louis, Mo., June 12, 1876.
	Pædisca n. sp. gall moth on *Solidago lanceolata.* Washington. D. C.
	Nephelodes violans Guen.
Rhogas n. sp	*Scopelosoma sidus?* Guen. Washington, D. C., June 17, 1884.
Rhogas lætus Cress	*Acronycta dactylina* Grt. on Alder. Ottawa, Can., August 1888.
	Apparently same species found at West Cliff, Colo., collected also in Texas.
Rhogas harrisinæ Ashm	*Procris (Harrisina) americana* Harr. Jacksonville, Fla., October 9, 1879, and Kirkwood, Mo., October 18, 1881.
Rhogas geometræ Ashm	Geometrid larva. St. Louis, Mo.
Rhogas burrus Cress	*Acronycta hasta* Guen. on Wild Cherry. St. Louis, Mo., July 16, 1872.
	Acronycta lobeliæ Guen. on Oak. St. Louis, Mo., February 1, 1874.

Parasites.	*Hosts.*
Rhogas rileyi Cress	*Acronycta oblinita* S.-A. on Willow. St. Louis, Mo., April, 1868, and La Fayette, Ind. *Nephelodes violans* Guen. Ames, Iowa, June 11, 1887.
Rhogas platypterygis Ashm	*Platypteryx arcuata* Walk. on *Alnus serrulata.* Washington, D. C., October 23, 1883.
Rhogas nolaphanæ Ashm	*Nolophana malana* Grt. St. Louis, Mo., November 3, 1870.
Rhogas simillimus Ashm	Geometrid on Pine. Holderness, N. H., September 8, 1883.
Rhogas desmiæ Ashm	*Desmia maculalis?* Westw. Cadet, Mo., June 17, 1886.
Rhogas canadensis Cr	*Clostera inclusa* Hb. Washington, D. C., September 12, 1882.
Rhogas ceruræ Ashm	*Cerura* sp. ? on Willow. Napa County, California, August, 1887.
Rhogas melleus Cr	*Aplodes subrifrontaria* Pack. on *Eupatorium.* St. Louis, Mo., 1871. *Eucrostis zelleraria* Pack, on *Chrysanthemum.* St. Louis, Mo., October, 1871. *Aplodes rubivora* Riley on *Ageratum.* St. Louis, Mo., April 10, 1881. *Clostera americana* Harr. St. Louis, Mo.
Rhogas intermedius Cr	*Acronycta dactylina* Gr. on *Alnus incana.* Holderness, N. H., September 27 to October 5, 1883. *Acronycta oblinita* S.-A. Oxford, Ind., August 2, 1884. Washington, D. C., September 1, 1880. *Acronycta* sp. ? on Alder. New York, September 25, 1883. *Acronycta hastulifera* A. and S. on Alder. Washington, D. C., June 21, 1883. *Acronycta americana* Harr. on Maple. Kirkwood, Mo., October 7, 1877, and Lincoln, Nebr., November 4, 1889.

Subfamily Cheloninæ.

Phanerotoma tibialis Hald	*Grapholitha caryana* Fitch. Hickory-nuts. Kirkwood, Mo., April 5, 1873.
Sphæropyx bicolor Cr	Arctiid ? Washington, D. C., July 8, 1878.
Chelonus iridescens Cr	Phycid on *Aphyllon tuberosum.* San Diego, Cal., June 27, 1887.
Chelonus lavernæ Ashm	*Laverna eloisella* Clem. Kirkwood, Mo., 1881. *Laverna* sp. on *Epilobium angustifolium,* Cadet, Mo., September 3, 1886.
Chelonus pallidus Ashm	*Gelechia absconditella* Walk. on Polygonum. Washington, D. C., May 2, 1884.
Chelonus fissus Prov	Lepid. gall on *Ceanothus cureatus.* Colton, Cal., June 18, 1887.

Parasites.	*Hosts.*
Chelonus parvus Say	*Cecidomyia s.-strobiloides* Walsh. Pahreah, Utah.
Chelonus nanus Prov	Nematus gall on Willow. Los Angeles, Cal.

Subfamily **Sigalphinæ.**

Sigalphus curculionis Fitch	*Conotrachelus nenuphar* Hbst. St. Louis, Mo., June 15 to July 21, 1870.
	Borer in stalk of *Ambrosia.* St. Louis, Mo., May 4, 1873.
Sigalphus copturi Riley MS	*Copturus longulus* Lec. Washington, D. C. June 2, 1883.
Sigalphus nigripes Riley MS	*Andricus coxii* Bass. Fort Grant, Ariz., July 27, 1883.
Schizoprymnus texanus Cr	*Trypeta solidaginis* Fitch on *S. canadensis.* Washington, D. C., May 26, 1880.
	Trypeta gall on *Solidago.* Utah ? 1881.

(To be continued.)

ANTHRAX PARASITIC ON CUT-WORMS.

Four perfect bee-flies (family *Bombyliidæ*) which correspond with the description of *Anthrax hypomelas* Macq., have been sent us by our Indiana agent, Mr. F. M. Webster, and were bred by him last summer from the pupæ of a cut-worm which proved to be that of *Agrotis herilis.* Prof. C. P. Gillette, of the Iowa Agricultural Experiment Station, has also shown us one of three specimens of *Anthrax* (*scrobiculata* Loew) bred by him the past summer from cut-worm larvæ, the species undetermined. More recently Mr. Coquillett sent us a note for publication, covering a similar experience, from which we may quote the following:

Mr. Edwin C. Van Dyke, of this city, who is an enthusiastic young collector of insects, informs me that on one occasion he placed a Lepidopterous chrysalis in a box by itself, and that when next examined this box contained a Dipterous pupæ; the Lepidopterous chrysalis was found to be entirely empty, and in one end of it was a large opening out of which the Dipterous larva had evidently issued and afterward pupated. In due time this pupa produced the perfect fly, and this, together with its cast-off pupa-skin and the chrysalis-skin of its host, was kindly presented to me by Mr. Van Dyke. The chrysalis which it infested closely resembled that of *Taeniocampa rufula* Grote, a Noctuid which is rather common in this locality. The fly proves to be a specimen of *Anthrax molitor* Lœw, one of the commonest *Bombyliids* found in this State and scarcely distinguishable from the common *Anthrax flava* of Europe. The pupa very closely resembles that of *Aphœbantus mus* O. S., figured at 5, 5a and 5b, Plate XVI, of the Second Report of the U. S. Entomological Commission. On either side of the last segment are three short teeth, and on the under side of the head are five black tubercles, the anterior one being the largest, and the remaining four being disposed in two transverse pairs, those comprising the last pair being contiguous at their bases.

Though these are extremely interesting occurrences, and show that some species of *Anthrax* may prove of benefit in destroying cut-worms, they are not without precedent, as the group to which the species belongs is, according to Osten Sacken, known to prey normally on the pupæ of Lepidoptera, especially Noctuæ. In number of species this group is about equally represented in Europe and this country, and we find that this Lepidopterous parasitism, in regard to which both Osten Sacken and Schiner make only a generalized statement, was recorded by Zetterstedt as early as 1842. Meigen in 1820 stated that nothing was known of the early stages of *Anthrax;* Westwood in 1840, in his Introduction, mentions only its Hymenopterous parasitism; but Zetterstedt in the Diptera Scandinaviæ, writing in 1842, states that the eggs of the first section of the genus, which embraces the species with hyaline wings and the tomentum not entirely black (*A. flava* Meig., *A. circumdata* Meig., and *A. cingulata* Meig.), are deposited in the larvæ of Lepidoptera. Walker in 1851 makes the same statement in the Insecta Britannica, that some of the species are parasitic in Lepidopterous larvæ. In the second report of the U. S. Entomological Commission, p. 266, we have referred to Schiner's statement (as quoted by Osten Sacken) that the larvæ of the very nearly allied genus *Argyramœba* were parasitic in Lepidopterous pupæ, which fact has also been referred to by late German writers (*Entomologische Nachrichten*, 1885, p. 306). Osten Sacken refers particularly to this parasitism of *Anthrax* in the Biologia Centrali-Americana, published in 1886, where he states that a certain group of the genus is especially parasitic upon the Noctuæ. Glover in his MS. Notes on the Diptera, and also in Agricultural Report for 1866, states that "an *Anthrax* has been bred from the chrysalis of a moth."

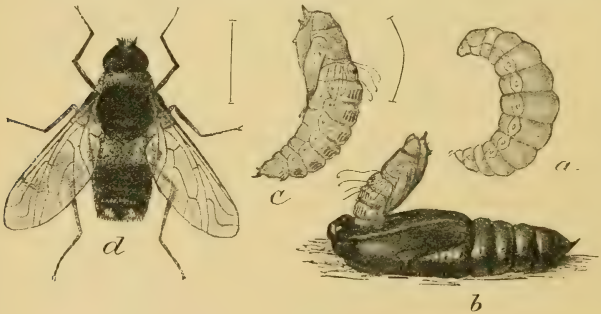

FIG. 67.—*Anthrax hypomelas:* *a*, larva from side; *b*, pupal skin protruding from cut-worm chrysalis; *c*, pupa; *d*, imago—all enlarged (original).

MOUNTAIN SWARMING OF VANESSA CALIFORNICA.

By C. L. Hopkins.

During an ascent of Mount Shasta, made in August, 1889, a most interesting occurrence was noted in the flight of countless myriads of butterflies (*Vanessa californica*) at an altitude far above snow-line.

In our early morning climb of August 29, of the above year, we had left our horses at half past 4 o'clock, at what is known as "Horse Camp," at very near snow-line, where there were many small snow fields close about us. Our progress was very slow and tedious, being all of the time over loose, sliding fragmentary rocks, or the almost smooth, hard-frozen surface of the icy snow, and which latter did not soften till long after the sun had swung high enough to shine full upon it. Some little time after day-light, but long before we could see the sun, as he was hidden from us by the high crest of a sharp ridge on the southwest aspect of the mountain (our ascent being made from Sissons, west of the mountain), a few signs of insect life were seen in the shape of "snow-fleas," two or three large-winged grasshoppers, and, occasionally at first, a butterfly. The last two were stiffened by the cold as if they were there from the day previous. The latter insect increased much in numbers as we ascended, and were many of them found in among and under the loose stones as well as a few upon them.

At perhaps half past 9 we came to a point upon which the sun had long been shining, and here they were flying in the air, the flight being in a southeasterly direction. From here they seemed to increase very rapidly in numbers up the remainder of the ascent to well toward the summit. The latter was reached at 11.20 a. m.; the temperature was noted at 42° Fah. in the open air. We remained here about a half hour, then passed down by way of the Hot Sulphur Springs, and then out on the southerly face of the mountain. We again encountered our beautiful friends at not farther than six or eight hundred feet below the extreme peak, and now in countless numbers, filling the air with their flashing wings, and all passing in the same direction as observed during the ascent—towards the southeast. This strange sight continued until we seemed to pass below them, at an altitude of between 11,000 and 12,000 feet. The fact of its being a continuous flight of these insects across the mountain in one direction during the warm part of the day—a period of nearly five hours—is beyond question. That it was in progress one or more days previous to that upon which I observed it is an easy deduction from the fact of the numbers of the insects found among the rocks and stones while yet stiffened by the cold of the night air. How much longer it may have continued I had no means of knowing.

Where they could have come from, in such vast numbers, and what brought them to such a high altitude, is of course a matter of pure speculation.

I had no means of preserving specimens of these insects except to place them between the leaves of a note-book; in this way some were kept for identification. A gentleman whom I met a few days later pronounced the species to be *Vanessa milberti*, but after presentation of the account of the flight, with the specimens, before the Biological Society of Washington it was determined for me by Mr. Howard as *Vanessa californica.*

MARCH 1, 1890.

NOTES ON A SPECIES OF NECROPHAGOUS DIPTERA.

By F. M. WEBSTER.

The extent to which the mortal part of man is preyed upon by worms and insects, after being consigned to its final resting place, has, no doubt, been greatly exaggerated in the popular mind. Cases of such are doubtless exceptional, the exceptions being by no means common.

The gentleman to whom I am indebted for the specimens and facts upon which this notice is based tells me that within the last five years, and among seven cases of disinterment, this is the only instance which has come under his notice. Of these, four of the bodies had been buried nearly two years or over, and three had been buried about four months. As these disinterments were all made in connection with legal investigations of matters usually of a criminal nature, everything about the graves or on or about the bodies was carefully noted, and, therefore, had anything of the kind occurred in any of the other six cases it would most certainly have not escaped observation.

On February 1 of the present year, Dr. W. H. Peters, physician and analytical chemist, of La Fayette, Ind., placed in my hands, for investigation, a small quantity of light-colored sediment, intermixed in which were quite a number of small flies, later determined by Professor Riley as belonging in or near the genus *Conicera*, numerous pupæ and a single larva, the sediment having been placed temporarily in a vial of water. These insects, in the various stages of development, Dr. Peters stated had been obtained by himself from a corpse which he had examined only two days before.

The body was that of a male, German-American, age sixty-two years, height about 5 feet 9 inches and weight about 165 pounds. The death had been a violent one, and had taken place on January 31, 1888, the body being interred on February 2, two days later. The temperature, according to authentic records, during the time intervening between death and burial ranged from 28° to 37° Fah. The coffin was of wood and of the best modern manufacture, being practically air-tight when

closed and the top fastened down, and encased in a box of pine. The grave was of ordinary depth, the soil in which the box and inclosed coffin rested being the upper strata of blue clay—proverbial for its compactness.

The body was exhumed on January 29, 1890, the pine-box being little decayed and the coffin apparently in perfect condition, but on removing the cover of the latter, the body, though exhibiting little indication of putrefaction, presented a very mutilated appearance with every indication that the missing portions had been attacked and destroyed by some element other than natural decay.

The front walls of the abdomen and thorax were gone, except small portions of the ribs and sternum, which were so friable as to be easily broken in the fingers, the ribs being readily severed by a pair of ordinary surgeon's scissors. The thoracic organs were gone, but the back wall of the thorax was only slightly imperfect. The front wall of stomach gone, back wall perfect, as also was the left kidney and spleen, lying beneath, and also portions of the intestines. The liver was unattacked but converted into adipocere, while the right kidney was destroyed. The back wall of abdomen was perfectly preserved; no trace of decomposition being visible. The flesh from the face had entirely disappeared. All of the tissues affected appeared to have been converted into grumous, viscid matter, of small bulk.

A considerable number of the flies were observed by the doctor moving about over the corpse, and living larvæ were noticed in the flesh, while the whole exposed surface of the body was quite thickly covered with pupæ, giving it the appearance of grains of wheat having been strewn over it. Analysis of that portion of the abdominal contents which would have included the contents of the stomach revealed arsenic in small quantities, as did also the liver.

That the larvæ of these flies might subsist upon the flesh of bodies killed by arsenic is by no means surprising, as they are, doubtless, very tenacious of life; yet it will be observed that the best preserved portions of the body and organs were those which would be the most likely to come in contact with the poison contained in the stomach. This, however, must not be taken as proof that the larvæ could not have subsisted upon slightly poisoned flesh, but the following statement found in Woodman and Tidy's "*Forensic Medicine and Toxicology*," p. 303, copied from "*Lancet*," August 23, 1856, p. 231, requires considerable verification before it can be accepted:

> A curious case is recorded, where about one hundred and fifty pheasants were poisoned from eating the maggots generated in some animals destroyed by a strychnia vermin-killer.

These flies, both sexes of which were secured, were entirely new to me, not having before observed anything like them, and while the presence of arsenic in the stomach did not render the presence of these ghoulish feasters more surprising, still, I was and am yet unable to

account for their occurrence in the coffin, as observed by Dr. Peters. That adults or larvæ could have made their way to the body through box and coffin, after burial, seems incredible; while that, with the temperature but little above the freezing point, flies should have been attracted to the corpse, while the latter was awaiting interment, and either deposited their eggs upon it, before burial, or have been conveyed within the coffin to the grave and there began reproduction, appears at first thought almost equally impossible. The fact that the man had died suddenly, in the midst of good health, would rather imply the early appearance and rapid progress of decomposition and, thereby lead to the inference that the odors arising from the body would become more generally diffused throughout the house where this body was being kept, and thus attract any flies which might be present in or about the building. On the other hand the condition of the remains on disinterment, together with the well-known preservative effects of arsenic, point directly the other way, and to this feature we must also add the absence of the odors contingent to the sick-room, whatever their influence might be in attracting the flies. Furthermore, the room in which the body reposed was not heated, but the temperature kept as nearly as possible co-equal with that existing outside, viz, 28° to 37° Fah., the single door communicating with other parts of the house being kept closed as continuously as circumstances would permit. The building is of brick, and in the case of this particular room three of the four walls are outside walls.

These details are given thus minutely because if these flies inhabit our dwellings during the winter months, future studies should demonstrate the fact. Besides, Dr. Riley suggests to me that as *Conicera atra* is said by Schiner to breed in decayed radishes in Europe, the present species might have thus originated and been at the time inhabiting the cellar of this house and drawn therefrom by the odors of the corpse. In this case, I am assured that the cellar contained no vegetables except potatoes, which were not decaying, and that the cellar itself was in a cleanly and dry condition, and no portion of it was beneath the room containing the remains, but under an ajoining apartment, and that all of the floors were without holes or cracks. Also, that communication with this cellar was by a stairway leading from a small room, adjoining the one opening into the apartment containing the body, the door of this cellar-way being kept closed except on occasion of the by no frequent visits to the cellar itself. However, while these facts appear to considerably obscure the theory suggested by Professor Riley, I confess my inability to replace it with a more plausible one, and therefore present it as a substitute until some one can, in the future, throw additional light upon the problem.

MARCH 15, 1890.

ADDITIONAL NOTE ON SPIDER-EGG PARASITES.

By L. O. Howard.

BÆUS AMERICANUS.—The publication of my description of this species on page 270 of the last number of INSECT LIFE, has given me the pleasure of a card from Mr. J. H. Emerton, who informed me that I would find this species among some material sent to the Department by him some months ago, and search has revealed that he is correct. A number of female specimens have been found in a vial labeled in Mr. Emerton's handwriting, "Parasites on spider's eggs in orange cocoon, collected 1871."

In reference to this same species, Mr. W. Hague Harrington has written to Professor Riley as follows:

With reference to the description and excellent figure of *Bæus americanus* in the last number (p. 270) of INSECT LIFE, may I mention that Provancher has described a species of this genus (Additions et Corrections a la Faune Hymenopterologique de la Province de Quebec, p. 209, 25 June, 1887) as a Chalcid, under the name *Trichasius clavatus*. After characterizing the new genus formed to receive it, he gives the following (translated) brief description: "Length, .05 inch. Of a uniform reddish brown with the legs yellow. The antennal club black. Thorax densely punctured, metathorax rugose. Legs pale yellow, the last joint of the tarsus brown. Abdomen browner, polished but not metallic. Ottawa. Harrington." Evidently Mr. Howard has not recognized from its position and description the insect described by Provancher. He would hardly look for a *Bæus* among the Chalcididæ. The type, which is in my possession, seems to differ from *B. americanus* in being darker and in having the legs pale. I have not verified the measurement, which would make it about twice the size.

I am greatly obliged to Mr. Harrington, for this note and comparison of Abbé Provancher's description with specimens collected near Washington by Mr. Pergande shows that they are identical. Provancher's species should be known in future as *Bæus clavatus* (Prov.).

ACOLOIDES SAITIDIS.—Mr. F. M. Webster has just sent in twelve specimens of the female of this species which he bred from a spider egg-sac found under the bark of a log at Oxford, Ind., in October, 1884. This indicates that the species is quite wide-spread, as the specimens from which the species was named were reared by Mr. Bruner in Nebraska.

PREPARATORY STAGES OF SYNTOMEIDA EPILAIS Walker AND SCEPSIS EDWARDSII Grote.

By HARRISON G. DYAR, *Buffalo, N. Y.*

SYNTOMEIDA EPILAIS Walk.

Egg.—Hemispherical, the base flat, minutely punctured. Color, shiny pale yellow. Diameter 1^{mm}. Laid in a mass, nearly touching on the under side of the leaf.

First larval stage.—Head brownish, paler down central suture and triangular plate; eyes black; mouth dark brown. Width of head, $.5^{mm}$. Body pale yellowish white with black spots, arranged much as the warts of the Arctiinæ, each bearing one or more black hairs. Cervical spot brownish, and this as well as the anal plate has a row of small black spots. Feet, all blackish. Length, 2^{mm}. As the stage proceeds, the body becomes pale orange yellow.

Second larval stage.—Head pale yellowish brown, eyes and mouth dark. Width, 8^{mm}. Body, yellowish; spots black, as in mature larva, bearing thin tufts of black hairs, those at the extremities being the longest. Feet, black. Length about 4^{mm}.

Third larval stage.—Head reddish orange; mouth dark. Width 1.1^{mm}. Body reddish orange with black spots bearing pencils of hair as in the last stage, but the hair is only $.4^{mm}$ long. Length of larva about 8^{mm}.

Fourth larval stage.—Head orange red; mouth dark. Width 1.5^{mm} body as in last stage, but the subdorsal and other black marks, not bearing hairs, are absent. Length 15^{mm}.

Fifth larval stage.—Mature larva. Head round, orange red, paler above the mouth. Palpi whitish; eyes and jaws dark brown; a few hairs. Width of head 2^{mm}. Body, orange red with round, elevated, shiny black spots as follows: (1) in subdorsal space, anteriorly on joints 5 to 12 inclusive; (2) subdorsal row; (3) superstigmatal row; (4) stigmatal row of small spots each posterior to a spiracle; (5) and (6) are subventral rows, the lower consisting of large long spots above the base of each leg, while joints 2, 3, and 4 have only one subventral row. Cervical spot and anal plate have a row of small black spots. The subdorsal and stigmatal rows on joints 3 and 4, the superstigmatal on joints 5 to 11, and the subdorsal on joints 12 and 13 bear each a long (10^{mm}) pencil of fine black hair. The others have a thin tuft of short hair. Black marks occur in the subdorsal space joining over the dorsum on the middle segments, situated posteriorly. Another row of spots in stigmatal space also posteriorly, and a fainter row in the subventral space, the latter in some examples nearly forming a band. Thoracic feet black, abdominal, black outwardly. Spiracles small and black. Length of larva about 30^{mm}. Diameter of body 4^{mm}.

Cocoon.—Composed of silk and the larval hairs and constructed in some inclosed place. It is thin and weak.

Pupa.—Depressed behind the thorax; very slightly flat below; abdominal segments without motion and cremaster absent. Color dark orange with black streaks, as follows: A spot on the head; two on the collar; two irregular angulated lines on the thorax; lines on cases of anterior legs and antennæ cases; two large and three or four small streaks on the wing-cases; abdominal segments have a transverse band on each of irregular width, some of them, especially at the anterior and posterior segments, interrupted. Length, 17^{mm}. Width, 5.5^{mm}.

Food-plant.—Oleander, *Nerium odorum.* Larvæ from Dade County, Fla., on the ocean side of Lake Worth.

SCEPSIS EDWARDSII Grote.

Egg.—Probably hemispherical, the base flat; smooth. Diameter, .7^{mm}. The color could not be ascertained, as the egg had hatched and the shell had been nearly devoured by the little larva.

First larval stage.—Head shiny pale straw color, the eyes brown. Width, .4^{mm}. Body, semitransparent whitish; warts arranged as in the mature larva, small and blackish, with scanty, but rather long black and white hairs. Length, 2.5^{mm}.

Second larval stage.—Head shiny light yellow. Width, .5^{mm}. Body whitish, dorsal band purplish obsolete anteriorly, in some examples interrupted by orange spots posteriorly. Warts whitish, some of those on the dorsum black. Hair still rather scanty. Length of larva, 4^{mm}.

Third larval stage.—Head shiny pale yellow, eyes black, mouth whitish. Width, .7^{mm}. The body varies somewhat in its markings, but the design is as follows: Body whitish, a broad dark wine-red dorsal stripe, interrupted by orange spots on joints 4 and 12, the two upper rows of warts on joints 3, 5, 8, 11, and 13 black, the rest whitish; a white subdorsal line. The hairs are long, white, and black. Length of larva, 5^{mm}.

Fourth larval stage.—Head pale yellow, the triangular plate and mouth white; eyes black; width, .9^{mm}. Body pale yellowish white with a white subdorsal line. Joints 3, 5, 8, 11, and 13 are black in the subdorsal space as are the warts. The other segments are tinged with orange, especially joints 4 and 12.

Fifth larval stage.—Head yellowish orange, triangular plate, mouth, and palpi white, the former bordered above by a deep black shade, more or less extensive. Eyes black; width of head, 1.2^{mm}. Body as before; length, 10^{mm}.

Sixth larval stage.—Head as in the mature larva; width, 1.6^{mm}. Body very pale yellow, with a narrow interrupted white stigmatal, rather broad yellowish white subdorsal, and broad black dorsal band, the latter dilated on joints 3, 5, 8, 11, and 13 to inclose and cover the two upper rows of warts, nearly interrupted on joints 4 and 12 by a large orange patch, and on joints 6, 7, 9, and 10 bisecting a fainter orange patch. Hair white, but largely black from the black warts. Length of larva, about 14^{mm}. The pencils of brown hair found on the mature larva on joint 5 are present in some examples, though small.

Seventh larval stage.—As in the previous stage, but the pencils on joint 5 are more prominent and the transverse band on joint 4, found in the mature larva, is present, being yellowish tinged with orange. Width of head, 2.2^{mm}. Length of larva, 20^{mm}.

Eighth larval stage.—Mature larva. Head, brownish red; triangular plate, mouth and palpi white, the former bordered above by a broad black band. Jaws and eyes black. Width of head, 3^{mm}. Cervical spot, blackish, bisected. The warts are arranged as follows: On joint 2, which is much contracted, are two small warts at the spiracle; on joints 5 to 12 is a row of warts in the subdorsal space, situated anteriorly; a subdorsal row; a superstigmatal row; a substigmatal row; two subventral rows on joints 5 to 12, the upper small; only one row on joints 3 and 4. Joint 13 has the upper warts reduced in number and has a row of small ones on the anal plate. Body dirty whitish, a blackish shade on the dorsum, with subdorsal, and traces of stigmatal, yellowish white band; above the former, on joints 5 to 10 and on 12, is a faint orange patch, the brightest being on joint 12. Posteriorly on joint 4, across the subdorsal space, is a pinkish white band with a dark border anteriorly, and on joint 5, from the warts in the subdorsal space (first row) grow two little pencils of brownish red-plumed hairs. Sometimes similar but much smaller pencils appear from the subdorsal warts (second row) of joint 12. The warts all bear yellowish, bristly hairs, some of which overhang the head. Legs concolorous with the body, the claspers of the abdominal tipped with brown. Length of larva, 30^{mm}.

Cocoon.—Spun on any flat surface without covering. It is made of silk and the larval hairs which are laid more roughly at the point at which the imago will emerge. The whole of the under side is fastened to the supporting surface.

Pupa.—Cylindrical, flattened a little in front, the dorsum very slightly depressed behind the thorax. Abdominal segments without motion. Body punctured and wing cases creased, but slightly. Cremaster covered by a bundle of short hooks and surrounded by similar hooks on the last segment, which also extend up the dorsum in little transverse rows. Color, red brown. Length, 14^{mm}.

Throughout the larva is subject to considerable variation. The duration of each stage was three days, except the last two, which were longer. Pupa, 14 days.

Food-plant.—The rubber tree, *Ficus pedunculata*. Larva from Dade County, Fla.

THE TULIP TREE LEAF GALL-FLY.

Diplosis liriodendri O. S.

In the *Garden & Forest* for December 18, 1889, Mr. J. G. Jack again publishes a good account of an insect with which we have long been familiar and about which we have had notes for a long time in the notebooks of the Division which have not seen the light of print.

One of the earliest objects of entomological interest which met our eye when we first came to Washington was a tulip tree, the leaves of which were badly infested by this species and which stood under the window of the Division of Entomology. Attempts were made by Prof. Comstock to rear the adult early in the summer of 1879, but he did not succeed until with a later brood the same season. In October, 1879, however, several adults representing both sexes were reared, and descriptions of these, as well as of the early stages, have since remained unpublished in the notes of the Division.

Mr. Jack, as appears from his article, has recently reared the same insect around Boston, and is the first to record the appearance of the adult. Osten Sacken, in 1862, described the gall and the larva, but did not rear the fly. The appearance of the galls is well described by the latter author in the following words:

> Brown spots with a yellow or greenish aureole on the leaves of the Tulip tree (*Liriodendron tulipifera*). These spots, about two-tenths or three-tenths of an inch in diameter, indicate the presence inside of the leaf of a leaf-mining larva of Cecidomyia. * * *

The effect of the blotches at Boston is described by Mr. Jack and corresponds well with the results of the work of the insect as seen at Washington:

> Many people who have always counted upon their Tulip trees as belonging to one of the few species free from serious insect attacks, have, by midsummer, been disgusted to find the leaves filled with large, brown, and yellow blotches. In some instances the foliage, by the end of August, has become so brown and twisted from the effect of numerous spots in every leaf that it has had the appearance of having been scorched by fire, and many of the leaves having thus become dead and dry fall to the ground.

Each of these spots before maturity contains a single orange-colored maggot which issues, when full-grown, through a slit at the edge of the under side of the blotch and falls to the ground to transform.

Mr. Jack finds three or more annual generations at Boston, the final larvæ dropping to the ground in September and hibernating as pupæ.

Our notes indicate that there are also three broods at Washington and, although we have reared the adults in October, we surmise that the species normally hibernates in the larva or pupa state underground.

The figure of the adult accompanying Mr. Jack's article is faulty in regard to the third vein of the wing and in the absence of the cross vein. The female antennæ are also 14-jointed instead of "apparently 13-jointed." His implied criticism of Loew, however, to the effect that the male antennæ are 14-jointed instead of 26-jointed, is probably correct, as in the antennæ of every male Diplosis, with which we are familiar, the true division is at every other bulb instead of at every bulb.

The remedy of late fall or early spring plowing and rolling suggested by Mr. Jack will probably greatly reduce the numbers of the pest.

AN EXPERIMENT WITH COCCINELLIDÆ IN THE CONSERVATORY.

By F. M. Webster.

The extent to which the various species of *Aphididæ* and *Coccidæ* enter into the food of this family of beetles has led to the suggestion that they might be utilized in keeping some of our greenhouse pests in subjection, at least during the winter season. As nothing definite appeared to have been done in this direction, some experiments were begun during the fall of 1889, with a view of learning whether or not the colonization of these beetles, in conservatories, could be made of practical benefit to the florist, and, perhaps, to the market gardener also.

The prospect of realizing any very enthusiastic expectations was somewhat dampened at the start from the fact that the terms "Scale," "Mealy bug," and "Green fly" are far from being specific terms, and might each apply to an indefinite number of species, while considerable evidence has accumulated in this and other countries, going to show that the several species of Coccinellidæ are not indiscriminate feeders, but confine their attention each to some particular species, or, at most, include but a small number on their "bill of fare." Therefore, the results obtained by experimentation with one species might not hold good with another, and, indeed, it might be that, in case one species of beetle proved effective as against its particular favorite among the Aphids, several species might be required to work out beneficial results. From this it will be readily observed that the experiment is one which can not be carried out in a single year, or in a single locality, for the reason that the species of Coccinellidæ are not equally distributed or yearly equally abundant.

Partly because of its great abundance, and partly because it had been observed feeding upon several species of Aphides, among them one in-

festing the rose, *Coccinella 9-notata* Hbst., was more particularly selected for the purpose of carrying out one portion of the experiment, other species being included in smaller numbers only.

The experiment began July 26, by transferring fifty adults of *C. 9-notata* from the fields to the conservatory. September 24 there were added to these sixty-two, and two days later fifty-six others. These last included also a very few *Megilla maculata*, *Hippodamia convergens* and *H. 13 punctata*. October 1, thirty-four more were placed as the others had been, these being nearly all 9-*notata*, and were mating at the time. On October 15, many young larvæ were observed running about over the potted plants, but despite these the Aphides increased so rapidly that it became necessary to fumigate with tobacco smoke to protect the plants, and a very light fumigation was applied. Although the smoke did not appear to affect the larvæ, they continued to decrease in numbers, though only a very few seemed to reach maturity, a single adult, *H. convergens*, being the only evidence that any of the larvæ had developed. At present writing, March 15, of the two hundred and two individuals placed in the conservatory, there remains not a trace, either of themselves or of their progeny, while "green fly" has abounded, as usual.

For the other portion of this colonizing experiment *Chilocorus bivulnerus* Muls. was selected. A couple of white spruce trees *Abies alba*, on the campus of Purdue University, became thickly infested by *Mytilaspis pinifoliæ** which, as is usual in such cases, attracted myriads of the Ladybeetle.

On October 22, several hundred of these beetles were transferred from the spruce to another compartment of the same conservatory, devoted exclusively to tropical and subtropical plants, ferns, etc., upon which were large numbers of *Coccidæ*. For a few weeks after being liberated an occasional beetle would be observed, while dead ones gradually became more numerous until no living beetles could be found. Outside, however, they were present about the spruces in great numbers on warm sunny days, and continued to remain up to date of writing. Not a living individual has been observed in the conservatory for three months, yet the "Scale" and "Mealy bug" have in nowise diminished in numbers. This compartment has not been fumigated, nor has anything been applied to the plants which could in any way affect the Ladybeetles, and therefore both features of the experiment must be set down as yielding information decidedly adverse to the colonization of either of these species of Coccinellidæ in our conservatories.

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*I may perhaps be pardoned for stepping aside from the tenor of this notice in order to record the fact of this scale being attacked by the Insidious Plant-bug, *Triphleps insidiosus*, and which I several times detected with its beak thrust into the body of the female *Mytilaspis*.

A NORTH AMERICAN AXIMA AND ITS HABITS.

By L. O. Howard.

In the Transactions of the Entomological Society of London for 1862 (p. 373) Mr. Walker described an anomalous genus of Chalcididæ under the name of *Axima*, from specimens collected by Mr. Bates, at St. Paul, Brazil, the sole species receiving the name *Axima spinifrons*. Walker recognized in this genus affinities with the Chalcidinæ, Eurytominæ, and Eucharinæ, and also with certain exotic genera which connect the Pteromalinæ with the Cleonyminæ.

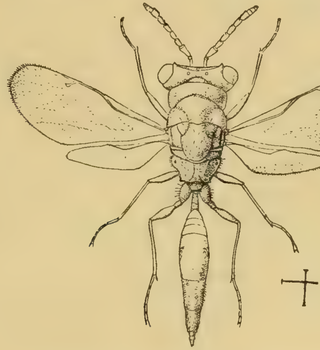

Fig. 68.—*Axima zabriskiei*—Female, from above—enlarged (original).

In July, 1884, Cameron, in the *Biologia Centrali-Americana*, erected upon this genus the subfamily *Aximinæ* and added the Central American genus *Hontalia*. He recognized its relationships with the Chalcidinæ and Eurytominæ. *Hontalia*, however, differs from *Axima* in its thickened and toothed hind femora and in the strongly exserted ovipositor, and Cameron has made a slip in giving as a subfamily character "posterior femora thickened, minutely toothed," which, however well it applies to *Hontalia*, is not applicable to *Axima*.

Mr. Ashmead, in the Proceedings of the Entomological Society of Washington, Vol. I, p. 219, mentions the occurrence of a form closely allied to *Axima* among some South American Chalcididæ collected principally along the Amazon by Mr. Herbert Smith, and which, as a transition form, convinced him that *Axima* really belongs to the *Eurytominæ*.

I had previously reached a nearly similar conclusion from examination of the true species of *Axima*, described in this paper, and also from two transition forms in the collection of the National Museum, the one

collected by Branner & Koebele, at Benito, province of Pernambuco, Brazil, in February, 1883, the other occurring in the Belfrage collection from Texas. One of the principal reasons for arriving at this conclusion is the distinctively Eurytoma-like antennæ of the male, as shown in figure 69. Walker did not know the male of his species. Without an examination of the types of *Hontalia*, however, it will be premature to condemn the subfamily *Aximinæ*.

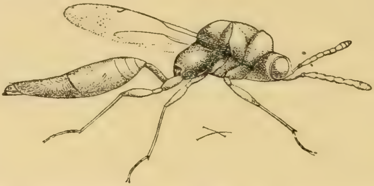

FIG. 69.—*Axima zabriskiei.*—Female, side view—enlarged (original).

To the Rev. J. L. Zabriskie, formerly of Nyack, N. Y. (now of Flatbush, L. I.), is due the credit for first ascertaining the habits of this anomalous group of Chalcidids, although the genus had been found in North America before he reared it, as I recognized in 1887 specimens in the collection of the Cambridge Museum. These were labelled, apparently in the handwriting of Mr. H. G. Hubbard, who left Cambridge in 1874, "Larvæ found in burrows of small blue bee, FreshPond, Mass." I also find in my notes on some of the Chalcids in the Cornell University collection, which I made in 1887, the following entry:

Axima sp. and *Ichneumon* sp. ex. *Ceratina dupla*? Larva of Axima has six or more strong dorsal tubercles and head of pupa is strongly tuberculate.

Mr. Zabriskie on three occasions reared quite a large series of the species about to be described from nests of *Ceratina dupla*, and there can be but slight doubt that *Axima* is a primary parasite of this little bee and probably of allied species. Mr. Zabriskie first reared it in July, 1878, from nests of the Ceratina, in stems of cultivated Black Raspberry, at New Baltimore, Green County, N. Y., and again in April, 1883, and April, 1884, from nests of the same bee, in stems of Sumach (*Rhus typhina*), at Nyack, N. Y. He reared in all twenty-five females and ten males. I briefly mentioned this fact on page 540 of Volume II of the Standard Natural History, but it has not elsewhere been recorded. Eleven specimens were sent by Mr. Zabriskie to Professor Riley, and from them the accompanying figures and descriptions have been made.

Axima zabriskiei n. sp.

Female.—Length 6^{mm}. Expanse, 7^{mm}. Head and thorax coarsely and densely punctate and with faint whitish pile; lateral ocelli just behind ridge extending from one frontal lateral projection to the other; median ocellus just anterior to this ridge, making the ocellar triangle very obtuse and in two different planes; metanotum rugose, with a few irregular longitudinal carinæ; pronotum with a faint median tubercle. Petiole of abdomen as long as metanotum, very finely shagreened and

irregularly and faintly carinate. Abdomen smooth, shiny, with patches of fine pubescence; a rounded patch on sides of fourth segment, and fifth and sixth segments almost entirely covered. Fimbria of the metanotal callus quite long and white, and a row of rather long soft white hairs on outer margin of hind coxæ. General color black, with rather indefinite ferruginous markings; all over the thorax the black is so indefinitely blended with ferruginous as to make it impossible to define color areas; the ferruginous is more marked, however, on the sides of the pronotum and mesoscutum; antennæ black, scape reddish at base; all coxæ black and punctate; all trochanters dark honey yellow; all femora and tibiæ black in middle, dark honey yellow at tips; all tarsi honey yellow; abdomen ferruginous at base below. Wings narrow, short, reaching when closed only to middle of fifth abdominal segment, perfectly hyaline, veins very dark brown.

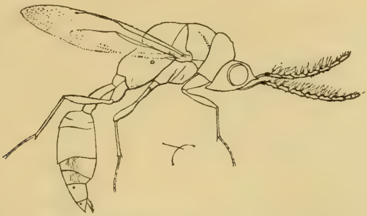

FIG. 70.—*Axima zabriskiei.*—Male, side view—enlarged (original.)

Male.—Differs only in the antennæ and in the shape of the abdomen, as shown in the figure. The frontal projections and the median projection of the pronotum are sharper and more pronounced than in the female.

Described from four female and three male specimens from Rev. J. L. Zabriskie, Nyack, N. Y., reared from nests of *Ceratina dupla.*

EXTRACTS FROM CORRESPONDENCE.

The Scale Question in Florida.

Some time ago a gentleman from Riverside went to Florida for the purpose of examining the orange groves and nurseries in that State to ascertain their condition in regard to being infested with scale insects, and a short time ago he informed me that there was scarcely a single orange grove in Florida over two years old that is not infested with *Mytilaspis citricola.* He further stated that many of the orange groves there were as badly injured by this scale as any orange grove in California has been injured by *Aspidiotus aurantii.* He also stated that next to *M. citricola, Mytilaspis gloverii* is the next most common species, and next to this is *Ceroplastes floridensis.* Yesterday a nurseryman, who is engaged in growing orange trees in Florida and shipping them into this State, called upon me, and informed me that in Florida *Mytilaspis citricola* is harmless; that he has never known it to injure orange trees, during his ten years residence in that State, and that it can not live in Southern California even if imported here. I would like very much to learn from you to what extent *M. citricola* injures orange trees in Florida. It is the commonest species that I receive for identification on trees coming from Florida, and our citrus growers are very anxious to learn to what extent it is injurious. I would also be glad to learn to what extent the Six-spotted Mite, which you recently described as the *Tetranychus 6-maculatus,* injures

orange trees in Florida. I found it on leaves of orange trees said to have been imported from Florida, but have never found it on trees growing here. It may interest you to know that the Vedalias have survived the winter, unprotected, out of doors. There are at least two places in this city where they are found at the present time. Occasionally a few Iceryas are found, but usually in very small numbers, and as the Vedalias have proved to be able to take care of themselves during the winter season, it is very probable that they will remain with us so long as any Iceryas are to be found.—[D. W. Coquillett, Los Angeles, Cal., April 8, 1890.

REPLY.—Yours of the 8th has come to hand. You have been misinformed as to the state of affairs in Florida. Some sections of that State are naturally more badly damaged by the species of *Mytilaspis* than others, and the Florida Wax-scale is, in my experience, not an especially injurious insect to citrus fruits. The relative importance of the Florida scale-insects is well set forth by Hubbard, and you can learn his opinion by consulting his work. My own experience, in a broad way, from personal observation, may be summarized thus: The three most injurious species in Florida are: *M. citricola*, *M. gloverii*, and *Parlatoria pergandei.* None of these insects are as injurious in Florida as either Icerya or the California Red-scale, or the San José Scale. They are more widely spread throughout the State and do not concentrate so injuriously in given localities. The Florida scales are also more amenable to treatment than the three species mentioned in California. At one time there was considerable alarm from the attacks of *citricola*, and a great many groves have been seriously damaged by it, but the most progressive growers at the present time do not fear it. Men who are ignorant of or fail to apply the best remedies still suffer. What truth is there in the rumor that *citricola* has become established in California? I send you inclosed some galleys from my forthcoming report for 1889, which will give you the latest information as to the damage done by the 6-spotted mite. I am very glad to learn that Vedalia so well survived the winter out of doors.—[April 16, 1890.]

A Palm-leaf Scale in Trinidad.

I inclose a piece of palm-leaf of *Prilohardia fibifera*, which is very badly infested by a scale insect of the genus *Mytilaspis*, so far as I am able to make out. The palms were obtained from the botanic gardens in Trinidad, and this insect is only to be found on the species mentioned, while the remainder were absolutely free of them, though they suffered from other pests.

Can you give me any information about the *Mytilaspis?* Unfortunately I have not been able to investigate the life-history of the insect, as the palms are growing in a garden which I can visit only now and then.—[A. Ernst, Caracas, Venezuela, South America, March 9, 1890.

REPLY.—The remarkable Coccid which you send me with your favor of the 9th instant, has only lately been described and figured as a new genus and species, *Ischnaspis filiformis*, by J.W. Douglas, in the *Entomologist's Monthly Magazine*, vol. XXIV, 1887, p. 21. Douglas found it in the conservatories of the Royal Botanic Society, of London, on the leaves of various palms (*Strychnos myriatica*) and other plants. Within the last year or so I find this species under the same conditions in the greenhouses of the U. S. Department of Agriculture at Washington, where it does much damage.—[March 22, 1890.]

The Cigarette Beetle.

My friend, Professor Gill, told me at the Cosmos Club that he had spoken to you about some "troyka" cigarettes that I got at the club, the paper of which had been pierced by a beetle. He told me you said it was the "Death-watch," and gave a latin name, which I did not completely catch, as several people were talking at the same time. To-day I found the inclosed beetle among some of the cigarettes as I was breaking them up. Professor Gill has some of the punctured cigarettes that I gave him; the rest have been destroyed. I inclose the beetle in a vial, and a piece of the

punctured cigarette paper with it, and I herewith send the same to you, as the animal may have some interest for your investigation. I do not want it again.—[A. A. Hoehling, M. D., U. S. Naval Hospital, Washington, D. C., April 11, 1890.

Reply.—I have your favor of the 11th instant and the accompanying specimen of a beetle which you found in cigarettes. This is *Lasioderma serricorne* Fabricius, popularly known as "tobacco beetle," one of the cosmopolitan insects, and known to infest not only dried tobacco leaves but also all sorts of drugs and spices. It is not identical with the so-called "death-watch" (*Anobium pertinax*), but belongs to the same family. Its life-history has often been treated of by various authors but presents no features of especial interest. It is referred to in Insect Life, I, No. 12, pp. 378–9.—[April 14, 1890.]

A Curious Case.

I send you by mail, in a little wooden pen box, marked with my initials, a small black insect for identification. This bug was found in a clothing store here, and had died after cutting through a pair of heavy woolen pantaloons, making eight holes about the size of a buck-shot. It does not seem to be like the moth which usually cuts woolens.—[Thos. C. Harris, curator State museum, Raleigh, N. C., March 27, 1890.

Reply.—The specimen which accompanies your letter is a wood-boring beetle (*Buprestis striata*), and it is probable that it issued from some of the wood-work within the store, and in endeavoring to make its escape cut through the clothing. The emergence of wood-boring beetles from furniture, which in some cases has been used for years, has been frequently reported. The larvæ in these instances were in the wood before it was used in manufacturing the articles of furniture.—[March 31, 1890.]

Beneficial Beetles infested with Mites.

By to-day's mail I send you a beetle which, with others, has been in a neighbor's cold frame, all of which he says have been covered with the minute ones. Are the small ones the same species, or are they parasites? If parasites, they are fully able to take care of the large ones; he did not say whether the large ones were destructive to his plants. The sleet of last week killed most of the Aphides that were hibernating on the rose bushes, some of which were literally covered from the ground to the very top. They did immense damage in this county (Camden, N. J.) to melons and cucumbers, as well as attacking currants and cherry and apple trees.—[I. W. Nicholson, Camden, N. J., March 13, 1890.

Reply.—Yours of the 13th, with specimens, duly received. The beetle is one of the ground beetles of predatory habits known as *Harpalus faunus*, and the small creatures upon its back belong to a species of parasitic mite known as *Uropoda americana*. This same species is a common parasite of the Colorado Potato-Beetle, and was first figured and described by me in ninth Report on the Insects of Missouri, page 41.—[March 14, 1890.]

Flea Beetle Injury to Strawberries.

I send you by same mail box containing specimens of small *beetles* which appeared here yesterday. The first I heard of them was in the western part of the county, on Tuesday. They appeared on my strawberries in *thousands*. You can judge of their numbers when I tell you that all sent were taken by holding the box under one leaf and shutting the cover down on it, and I expect you will find at least twenty-five or thirty in the box, and they are numerous all over the patch. All the berry fields in this neighborhood are infested. I have seen them also on weeds of different species and on peach trees. I have tried tobacco dust, wood ashes, and lime dusted over the plants, but these remedies only drive them off for a short time. Will you please in-

form me if you know the beetle, and if so, how destructive it is and how long it stays. It feeds on the leaves from the *upper side*, eating off all the green part of the leaf and leaving only the skeleton. The beetles are of a very bright shiny dark-green color, and fly about in clouds when disturbed. I am afraid they will destroy all the strawberries, and then I fear for our melons and beans. Please let me hear your opinion of the insect, and if you need more specimens or any further information as to its ravages, I shall be only too glad to give you the results of any thing I can learn of its habits. No one who has seen it here has ever seen it before.—[W. E. Hudson, P. O. box 58, Orlando, Fla., March 27, 1890.

REPLY.—The beetle you send is *Haltica ignita* Illiger. We would recommend dusting with air-slaked lime. It is difficult to treat on plants like the strawberry, on account of risk to fruit from the ordinary insecticides.—[March, 1890.]

Lecanium hesperidum.

In one of your letters, dated May 19, 1887, you incidentally mention that "it has been discovered recently that the male of *L. hesperidum* is often associated with the female scale, an undeveloped, wingless creature." As the *Lecanium viride* of the coffee is considered to be very closely allied to the former species, I have thought that the males may perhaps be found in the same situation. It would assist me greatly in my search if you could give me any further description of the recently discovered male of *L. hesperidum*. Does the male insect differ much in appearance from the female? What are their relative sizes? Does the male undergo any pupal stage, as in the other species of Lecanium? Is it active, and provided with a mouth? This pest is still in activity in legion, although it appears to be slightly decreasing in intensity.

I must thank you again for your extremely interesting periodical INSECT LIFE, which continues to be full of useful information upon all subjects connected with economic entomology.—[E. Ernest Green, Eton, Punduloya, Ceylon, India, February 15, 1890.

REPLY.—Your favor of February 15 came duly to hand. The male of *Lecanium hesperidum* was discovered by Monsieur R. Moniez, who published a description thereof and an account of its development in the *Comptes Rendus des Séances de l'Academie Française*, February 14, 1887; page 449. Various longer and shorter abstracts of this article have been published in several periodicals, *e. g.* in the *Entomologist's Monthly Magazine*, Volume XXIV, 1887, pages 25 to 27, which is probably accessible to you; but I am not aware that any independent investigations on the subject have been made or published subsequent to Moniez's original discovery. The fully developed male is excessively small, with no trace of eyes or wings, but provided with antennæ, legs, and with a short and broad penis. M. Moniez observed three stages of the male: In the first, the body has no appendages whatever, and no visible segmentation; in the second, which represents the pupa stage, the body has a distinct segmentation and contains fully developed spermatozoids and testicles; the third stage is that described above. In no stage has the male been found outside of the body of the parent, and copulation must, therefore, take place within the body of the parent female. I have had no opportunity so far to confirm Mr. Moniez's statements by personal observation, but in past years I have bred the winged males of several of our species of Lecanium.—[March 24, 1890.]

Flies in an exhumed Corpse.

I mail you to-day a species of Diptera in its various stages of development. This matter is of peculiar interest, as the material was taken from the corpse of a man who died two years ago (in midwinter of 1888), and was buried after the usual manner. A few days ago the body was exhumed, the coffin opened, and the front part of the chest and abdomen were found to have been completely eaten away, the mass of flesh and slime being alive with these flies and their larvæ. The material was given me

after standing in water for a couple of days, and therefore is in poor condition. When exhumed, both coffin and case containing it were in perfect condition, and the soil was a stiff blue clay. I can not myself account for the presence of these flies, except that the adults were hibernating in the coffin when used, or else the larvæ were in the stomach of the person when death took place. I have never met these flies before. Please let me know what you make out of them, and your idea of the manner of their first securing admission to the corpse.—[F. M. Webster, La Fayette, Ind., February 1, 1890.

REPLY.—Your letters of February 1 and 4 have come to hand, together with the specimens. The fly bred from a corpse belongs in or near the genus *Conicera* of the Phoridæ, although no species of this genus has before been mentioned in this country. The species which you have sent, however, has hairy eyes, while the European species are described as having naked eyes. Little is known of the habits in Europe, although Schiner says that *C. atra* breeds in rotten radishes. The experience which you relate is a most interesting matter and perhaps its publication may bring out further experience.

A number of cases of insects found on or breeding in corpses are on record in Europe. P. Mégnin, in "La faune des tombeaux" (Comptes rendus de l'Ac. des Sciences, v. 105, No. 20, Nov. 14, 1887, pp. 348–351) gives a summary of what is known, from which it appears that on exhumed corpses from two to three years old the following insects have been observed: Diptera, *Calliphora vomitoria*, *Cyrtoneura stabulans*, *Phora* (*Trineura*) *aterrima*, *Anthomyia* sp.; Coleoptera, *Rhizophagus parallelocollis;* Thysanuridæ, *Achorutes armatus*, *Templetonia nitida ;* Myriapods, *Julus* sp.

The two first named Diptera cease to work after the lapse of two years, and since they have occurred only on such corpses as have been buried in summer, it is evident that the eggs must have been deposited before burial.

The *Anthomyia*, *Phora*, and *Rhizophagus* are found, on the contrary, on corpses buried whether in summer or winter. Corpses buried two years have been found covered with myriads of the pupæ of the *Trineura aterrima*, and the larvæ of *Rhizophagus* have also been found in large numbers. The eggs of both insects are deposited on the ground, and Mégnin concludes that these larvæ work their way into the coffins through nearly seven feet of ground (2 meters). It is finally stated that the *Phora* prefers lean corpses, whereas the *Rhizophagus* has been found only on *fat* corpses. In your case it would seem the more probable supposition that the eggs were deposited before burial.—[February 10, 1890.]

SECOND LETTER—Glad to hear about the corpse-infesting flies. From the fact that this matter is likely to figure in a supposed murder case, I shall have to ask you to publish nothing for the present. A few additional facts I will, however, give you now, and shall probably get nearer to the bottom later, when I will furnish you with a note for publication.

The person in life weighed about 165 pounds; height, 5 feet 9 inches; age, sixty-two; male. Death accompanied with congestion of lungs, indicating pneumonia, pains in abdomen, and frothing at mouth. Died January 21, 1888. Coffin practically air-tight, constructed of whitewood, and inclosed in ordinary pine case. Undertaker stated at time that he had embalmed body, but now states that it was not embalmed. Substances used in embalming, arsenic and corrosive sublimate.

Body exhumed January 29, 1890. Case and coffin in perfect state of preservation; the latter appearing to be air and water tight. Face, abdominal thorax, front walls of abdomen portions of all abdominal organs, and the less solid part of ribs eaten away. Posterior portion of stomach and body not eaten. Analysis of stomach shows 1½ grains arsenic. Larvæ, pupæ, and adults alive at time of exhumation.

With the criminal and legal features of the case I have nothing to do, but how could these larvæ live in a body containing either arsenic or corrosive sublimate? (The chemist is searching now for the latter and I shall know results in a day or so.) If the man was not poisoned could the larvæ have killed him? It did not at first seem

possible that the fly couldbreed in a body poisoned either before or after death with arsenic, but in "Forensic Medicine and Toxicology," Woodman and Tidy, page 303, is an extract from "Lancet," August 23, 1855, page 231, in which the statement is made that "one hundred and fifty pheasants were poisoned from eating the maggots generated in some animals destroyed by a strychnia vermin-killer." I do not know whether to believe this or not. If we have a fly here in Indiana which can kill a man in mid winter and half devour him within two years, poison and all, it will be worth knowing.

A physician in the city made the analysis and gave me the flies, and has promised me that if it is necessary to exhume the corpse, I shall have the opportunity to inspect it. If you wish more material, or think of any points which can be cleared up in regard to the insect, please write me, and if the chance is offered I will get them.

Please, however, before printing anything on the subject, let me get all the facts possible in the case, when I will put them in shape and send you. Can you figure the different stages with the material you have?—[F. M. Webster, La Fayette, Ind., February 12, 1890.

Reply.—Your letter of the 12th has come to hand, and this further information makes the case of the corpse flies even more interesting. In the first place I do not think there is any possibility that the flies or their larvæ killed the man, and the case which you mention from the *Lancet* is rather improbable. I do not at all doubt that the flies could flourish in the body of the man had he been poisoned by taking a dose of arsenic, but it is less probable that they could live in the body if it had been thoroughly embalmed by injecting the usual arsenic and corrosive sublimate mixtures. Even the latter, however, is not so improbable as it would at first appear, for many of these Dipterous larvæ are very tenacious of life and very little affected by poison. I should by no means say that the fact that they lived in the body and bred in such great numbers is proof positive that the body had not been embalmed. Ptinid larvæ have been known to feed in the corks of bottles containing corrosive sublimate.

I find on examining the specimens here that they were kept in water too long to be in good condition for figuring. If you have other better flies send them on, and if you have an opportunity to secure fresh ones, let me have a set placed directly in alcohol. I will, however, have as good a figure as possible made from those which we have here.—[February 15, 1890.]

The May Beetle and the White Grub.

Have you given any attention to the period of abundance of the May Beetle, *Lachnosterna fusca*, and have you thought it worthy to forecast the year of swarming and attack on their favorite trees for food, as the walnut, hickory, butternut, and ash, invariably stripping off all the June foliage of that year? You are familiar with the life history, indeed your observations are the only ones made by an American entomologist on the common American form of dor-beetle, in reference to its transformations to full development, and I presume you have published the year of great swarming at various times.

I have noted for many years their stages of growth and length of larval and imago life, and by taking the three-year period easily predict their years of swarming, which were for the last decade 1883, 1886, 1889, and will come again in 1892. I have followed this series of broods backward and find it agrees with the swarming in Alabama in 1880, and that in Massachusetts in 1865; also that recorded in eastern New York in 1850. Certainly there is a small number of beetles on the wing every year, and there must be, therefore, two other series of broods, occupying the two intervening years.

I know that the entomologists of Europe predict the year of abundant swarming for their common dor-beetle (a triennial period also, I believe) which led to much preparation for destroying them; but, unfortunately for the reputation of those wise bug-men, something about the weather, fungous diseases, or parasites interrupted,

so as to cut off the brood in those districts, and thus the prophesied swarming never came. Has there ever been a break, in any section, respecting their abundance in the swarming year in this country?

There is considerable usefulness in the record of abundance of the May Beetle for the farmer. He can reckon that those fields in sod in the spring of the swarming year will be the depository for many eggs, the grubs from which will do but little injury that year, but would do much damage to corn or potatoes if planted on the sod ground the following year, but not so much damage the next year, because the grub becomes full-fed and grown to pupa stage by midsummer. The insect really experiences the warmth of four summer suns. The first June, an egg; the second June, a small growing grub; the third June, a nearly full-grown grub; the fourth June, a winged beetle.

I believe the earliest account of this beetle, in respect to a correct exposé of its life history through all the stages and length of time noted, was made in 1852 by David L. Bernard, Clintondale, Ulster County, N. Y., and may be found in Patent Office Report for 1852 (1853), page 219. It is remarkable that he seems not to have known any common or Latin name for the insect. He simply says the grub is the larva of a beetle, and then describes the growth.

It is a matter of constant observation everywhere that skunks feed upon the grubs to the extent of extracting every grub lying anywhere near the surface of the ground, and thus aiding the agriculturists in securing larger and better crops. If they were not trapped off so closely they would rescue the crops from many thousands of dollars damage. Moles feed on them, and I am led to believe the raccoon feeds on grubs in small extent and I presume the hedgehog may have that predilection, but I know of no other American mammal in farming districts so disposed, although some others may be led to acquire melolonthivorous habits; at least, I have found that one class of domesticated animals can be led to acquire a taste for the white grub and very soon exhibit a decided fondness for this grub, literal and pure.

Linne, my little son, without any definite design exactly, began coaxing his dog, a half terrier and spaniel, to eat the grubs. He was quickly successful, and since then this dog and a St. Charles spaniel from an adjoining farm, taking up the habit, both follow the plow all day to eat every freshly exposed grub, and often they scent them underneath the surface and dig them out.

To be sure, if the grubs are very plenty Tony and Ned get a surfeit in an hour, but usually they are in the field nearly the whole time the plowman is there, and they feast on the grubs with as much gusto as at the first, some two years ago. Thus they render a better service than the crows or ravens in those long-ago dreamy rural scenes where troupes of these birds are represented following the plowman to pick up every grub, and indeed some wire-worms, but also crowd in angle-worms and all the beneficial ground beetles and their larvæ.

From trials made with several kinds of domesticated dogs it appears to be easy to induce any variety of this class of quadrupeds to form this habit of eating to a purpose. I am not so sure but wild canines, like the fox, wolf, and coyote, eat grubs and other insects when hard pressed by hunger. The members of the Ursine order are abundantly on record as feeders of the honey, as well as the young grubs, of bees, and the bees too. And bears are known to be fond of the white grubs they dig out from rotten logs, as well as the May Beetle grub they find underneath the logs, besides eating locusts and other insects.—[W. L. Devereaux, Clyde, N. Y., February 8, 1890.

REPLY.—We have established little of a reliably definite nature relative to the life term of the larvæ of this insect, although a large series of notes has accumulated in the endeavor to establish the definite facts. These notes seem to show that at Washington the ordinary length of larval life is three years and that there are no definite broods; that beetles appear and oviposit every summer and that larvæ of all ages can be found in the ground at any given time. We are not prepared to say that these

are hard and fast rules for even this one locality, and we should certainly expect a variation with climate. The *Melolontha vulgaris* is said to remain three years in the larval stage in South Europe, and four years in North Europe.—[February, 1890.]

Parorgyia on Cranberry in Wisconsin.

I wish to call your attention again to some insects sent by my brother to you last summer. They were a lot of caterpillars. One species especially had done great damage on a neighboring cranberry marsh. The caterpillar was of a mouse-gray color, 1½ inches long, provided with feelers or horns. On his back there was a tuft of fur or hair, resembling the hump on a camel. You called it a species of *Parorgyia*. I also sent specimens to Professor Henry, at the Madison (Wis.) Agricultural Experiment Station. In his absence Mr. E. S. Goff replied. He called the insect that I speak of *Arctia*, and said that it is an enemy of the cranberry. In the interest of the Wisconsin Cranberry Growers' Association I respectfully ask for a little more light, if you can shed any from the above description or your personal experience. How do they pass the winter? And when does the moth deposit the eggs that furnish the brood which does the damage in July? The vine and fruit worm moths we successfully catch at night by means of lamps set in tin pans containing water, and a little kerosene oil on top. It kills them as soon as they strike the water in the pan. Now, is the moth of the former-described caterpillar of nocturnal flight? If so, they can be caught the same as the fruit moth. I will be thankful for any information that will enable me (not being an entomologist) to study their habits and mode of breeding. I have succeeded in raising a moth from the caterpillar. I wanted it to exhibit to the association last January or I would have sent it to you; perhaps then you could have readily given me the information I now seek.—[H. O. Kruschke, Deuster, Juneau County, Wis., February 24, 1890.

REPLY.—The moth sent by your brother last summer has been reared and proves, as I surmised, to be a species of *Parorgyia*, but the precise species can not be determined at this moment. An allied species lays its eggs late in July and the larvæ attain full growth by fall, hibernate in a web, transform to pupæ in the spring and issue as moths in early summer. The larvæ received from your brother, however, were nearly full-grown August 1, and the solitary moth which we bred issued August 21. This would seem to indicate either two broods or the hibernation of the partly-grown larvæ, moths of which emerge in August. Most of the larvæ which he sent were parasitized. The moths are night-flyers and would probably be captured by the same traps which you use for the vine and fruit worm moths. It is doubtful, however, whether this capturing of the moths will do much good, as careful examination of specimens so captured shows that the vast majority are males, or females which have laid their eggs. The best remedy will be to apply Paris green or London purple, as I suggested in my letter to your brother August 3, last.—[February 27, 1890.]

Helomyza sp. found in Mayfield Cave, Ind.

To-day I send you by mail a number of flies taken in Mayfield Cave on December 28, 1885. They were found under stones on the bottom of the cave, and sticking to the sides of the cave in sheltered places. They were not very torpid, as when I lifted up the stones they would generally commence to move. In the above cave they are abundant. I expect they may be found in other caves around here in equal numbers, although I have not hunted for them. You may keep them or else turn them over to the Smithsonian.—[C. H. Bollman, Bloomington, Ind.

REPLY.—I beg to acknowledge the receipt of your letter and specimens and to state that the flies which you found in Mayfield Cave belong to two different species, both apparently belonging to the genus *Helomyza*. Neither of the species is contained in the collection of the National Museum, and they may be both possibly new, although this is only probable.

A Cave Crustacean in a Well.

A friend of mine has a splendid well of water with a force pump in it. The water is always cool and has been clear until now. Lately it throws forth plenty of the inclosed specimens. Are they not Phylopods, or the Ear-wig, or is this the Lithobius, the crawling fellow we find in our house once in a while? Tell me all about it and how to clear the well.—[J. M. Shaffer, Keokuk, Iowa.

REPLY.—I beg to acknowledge the receipt of yours of the 19th instant, with specimen of an animal found in a well. This is the little crustacean described by Packard as *Cœcidotea stygia* and which has been found in Mammoth and other caves, in the little pools of clear cold water which abound in such locations. You will find a very good figure of this species, with an account of its habits, in the third volume of the *American Entomologist*, pages 35–36 (February, 1880).

Potato Stalk-borer in Corn and Rag-weed.

Mr. O. J. Voorhees brings me this morning samples of growing corn nearly a foot high which are being destroyed by larva unknown to me. I understand that the cornfields are largely infested. Will you please describe fully? Have you knowledge of a remedy? If so state it fully that it may be published for the common good.—[J. M. Shaffer, Keokuk, Iowa.

REPLY.—The worm which you send and which infests corn in your vicinity is the larva of a common Stalk-borer (*Gortyna nitela* Guen). This insect is a very general feeder and ravages not only corn but other cereals and also potatoes, tomatoes and a number of flowering plants which are commonly grown in gardens. By way of compensation it is particularly partial to the stem of the Cockle Bur (*Xanthium strumarium*). On account of its diversity of food plant, and on account of its feeding on the interior of the stalk, it is a most difficult insect to fight. The only remedy which has ever been proposed, and the only one which will result in any practical results, consists in cutting the larvæ out of the stalks which are observed to wilt from its attacks. This of course would be a most tedious operation in large quantities, but it is the only way to lessen the number of worms. The labor of boys could be readily utilized in this work. It has been previously recorded as damaging corn, but I think never to the extent which you describe.

ANOTHER LETTER.—As you request, I to-day send you a box containing a larva of the corn-stalk borer, marked No. 1, and three larvæ of what appears to be the same, which I found in rag-weed stalks, marked No. 2. In the corn they are rare at this season, but are rather common in the rag-weed. On the 29th ultimo I noticed one stalk where the borer had eaten out and left. In large corn they enter the stalk a few inches above the ground, and eat across nearly to the opposite side, and then upward. The first time I ever saw the borer was in 1882, in a piece of ground that had been pastured more than twenty years, and never plowed until that spring. There were quite a good many of them. The next year I had corn on the same ground and there were a few again. These were all near the edge of the field. This year I have corn on the same piece again, and they were all over it. One day about the 1st of June, I killed about fifty worms, and many more at other times. In 1884 I found a few in rag-weed along the edge of this same field, when it was in oats. This spring I found a few in another field over a quarter of a mile from the other infested ground. Others in the neighborhood are not troubled with them to any great extent. The most of their work is done when the corn is from 2 to 10 inches high, and before it begins to joint. Then the heart is eaten out just above the root, leaving the outside of the stalk green. The infested stalks may be known by the central blades being dead. This is the best time to destroy them. They are then from ½ inch to 1 inch long, and are easily killed by pulling the infested stalks up and crushing them.—[Thomas Wikessell, Wauseon, Ohio.

REPLY.—The Corn-stalk Borer (No. 1) and the Rag Weed Borer (No. 2) are both larvæ of *Gortyna nitela* as I supposed from your letter of the 27th ult. *Achatodes zeæ* is quite a different thing. The *Gortyna* is a very common insect and is found on a great many plants in addition to the two which you have mentioned. It first came into prominence as a potato stalk-borer and was described as such by Professor Riley in one of his early Missouri reports, and also in his little book on Potato Pests. It is also found in a number of other cultivated plants and large-stemmed annual weeds. No other remedy has been suggested than cutting them out of the stalks which they infest, by hand, and this of course would be impossible in a field of corn. As they seem to infest the Rag-weed on your place in considerable quantities, numbers can doubtless be killed by cutting and burning the weeds at this time, or while the majority of the larvæ are still within the stalks.

The Melon Worm.

It has come under my observation that the late crop of canteloupes in this section is generally very much injured by a bug or insect which bores a hole in the fruit when about half grown or just ripening, rendering it entirely unfit for use, while early crops are rarely if ever affected by this borer. The canteloupe crop will be much later than usual this year on account of continued excessive rains this spring, and want of warm weather to make the vines grow, and in anticipation of the trouble referred to, I would be very glad to have you give me a remedy if you know of any to avoid it.—[J. H. von Hasseln, Anderson, S. C.

REPLY.—The insect of which you speak is in all probability the Melon Worm of the South (*Phakellura hyalinatalis*). This insect is treated in the annual report of this Department for 1879, pages 218 to 220. The only remedy so far known is to watch for the first brood of the worms, which will probably be found feeding upon the leaves and stems before the young melons have begun to form. They should be killed by hand or by the application of Paris green and flour. At this late date when the second brood of the worms are boring into the melons there is no remedy.

Cut-worms and Carnations.

I send you by this mail some larvæ which I find near the surface of the ground around the roots of our carnations. There is something that eats a hole in the sides of the buds of our carnations and destroys the whole of the flower. Our gardener says that he believes this is the grub that does it, and that it goes up the stem in the night and feeds on the buds, and hides in the soil during the day. As we have not seen it around here very long I send it to you for a name.—[Thomas B. Meehan, Germantown, Philadelphia, Pa.

REPLY.—The insect which you send is the Variegated Cut-worm (larva of *Agrotis saucia*) and it is altogether likely that it is responsible for the damage to carnations which you describe. You will find this larva treated in the annual report of this Department for 1884, pages 297 and 298. The subject of "Remedies for Cut worms" will be found on pages 298 to 300.

The Plant-feeding Lady-bird and the Potato Stalk-beetle.

I take the liberty of forwarding to your address by mail to-day specimens of a bug (also egg-clusters) which proves to be very destructive to the bean crop in Colorado. It seems to be closely related to the potato-bug. The hairy slug defoliates bean vines in the same way that *D. decemlineata* defoliates potato-vines. I have recommended the Paris green remedy also for this pest. Will you favor us by giving *name* and *history* of the insect? Can you suggest a better remedy than Paris green?

Can anything be done to prevent the ravages of *Baridius trinotatus*, which threatens the destruction of the potato fields in some sections of Pennsylvania?—[Tuisco Greiner, Little Silver, N. J.

REPLY.—This insect belongs to the only genus of the Coccinellidæ or "Lady-birds" which is plant-feeding in its habits. It is *Epilachna corrupta.* I can suggest no better remedy than Paris green.

Baridius trinotatus is an insect which can only be fought by pulling up and burning the infested stalks. It is a tedious remedy but a sure one. As the insect transforms within the stalk this remedy is efficacious at almost any time.

Intrusion of the Elm Leaf-beetle in Houses.

I now take the liberty to intrude upon your time with a few words concerning the habits of this (the Elm-leaf) beetle, with which you may not be so unfortunately acquainted as I am. It was in 1883, in the fall house-cleaning, that my attention was called to these creatures, then unknown to me, massing themselves in close packs behind pictures. In 1884 I noticed the trees for the first time being stripped, and that fall more bugs came in, and in the spring of 1885 they appeared in great quantities about the windows, but soon left the house for the trees, as we suppose. During the summer of 1885 the Elm trees were wretchedly stripped, and last August, as early as the 6th, these beetles came to the house in swarms. The house was thoroughly netted, but nets were of no use. They only disappeared during real winter weather to re-appear this spring, in April and May, in quantities. The old-fashioned garret is full of them; killing off day by day with powder makes no difference except for that day. The shingled roof is full; the window boxes where the cords play are full; the windows are daily covered, especially on the upper part, with quantities. They eat no flannels or woolens of any kind, never bite nor molest the body except liking to sleep in one's bed; they fill drawers, boxes, books, etc., and show no disposition to go out to the trees, and what they subsist on is a puzzle. Please excuse this great liberty; the truth is, that with every effort to bear the plague philosophically, the natural dislike of the housekeeper to be worsted in a battle with any even the most aristocratic insect prevails in my case, and I thought it just possible you might be able to tell me of some one thing that would give me the victory I desire, at the sacrifice of my hospitable instincts.—[H. S. Onderdonk, Great Neck, Long Island, N. Y.

REPLY.—The account which you give of the great numbers in which the Elm Leaf-beetle infests your house is very interesting, but I am sorry to say that I can offer you no encouragement in regard to any remedy beyond what you will find published in Bulletin 6 of this Division (which we have already sent you), and beyond the free use of Persian insect powder in your house.

Re Lestophonus.

Yours of the 21st instant, inclosing duplicates of the articles on the Lestophonus and its parasites, is just received. The facts are so clearly and correctly stated in these articles for INSECT LIFE that I am unable to suggest any change or alteration.

In regard to the manner in which I treated Koebele's second sending of Australian parasites I will say that Mr. Koebele advised me to subject the contents of each box to chloroform, then open each box and destroy all of the Chalcids and transfer the Lestophoni to the tent. However, I was unwilling to expose the Lestophoni to such a risk of life, so I had constructed two sacks of a muslin so thin that I could easily distinguish from the outside the Chalcids from the Lestophoni as they rested on the inside of the sack; the sacks were about 3 feet high by a foot and a half in diameter, and were sufficiently close in texture to prevent the escape of either the Lestophoni or the Chalcids. In these two sacks I emptied the contents of the boxes of parasites, tied up the tops of the sacks, then destroyed the Chalcids by pinching them between the thumb and finger, without opening the sacks, after which the sacks were opened and the Lestophoni liberated into the same tent in which I placed the first consignment of these flies.

The Chalcids are easily distinguished from the Lestophoni as they sit on the inside of the sacks, not only by their more slender form, but especially by their habit of

always holding their wings lying flatly upon the back when not in use, instead of holding them partly expanded, as the Lestophoni do. The latter when disturbed usually fly upward, and are thus easily liberated from the sacks, while the Chalcids when disturbed simply leap a short distance and again alight lower down upon the inside of the sack. I have examined these sacks every few days and carefully destroyed the Chalcids and then liberated the Lestophoni. These two muslin sacks I kept inside the tent. The contents of some of the tin boxes which were in worse condition I put in a paper bag, pinned it shut and kept it in my room; nothing but Chalcids have appeared in this bag, and all of these have been carefully destroyed. Altogether there have issued from this second sending up to date twenty-four Lestophoni and one hundred and sixty-one Chalcids.—[D. W. Coquillett, Los Angeles, Cal., January 27, 1889.

GENERAL NOTES.

BOILING WATER FOR PEACH BORER.

Mr. John B. Haas, in the *Pacific Rural Press* for March 22, gives the result of a very conclusive experience in Missouri some years ago. He removed the soil around his infested trees for a depth of 3 or 4 inches, making a trench from 3 to 6 inches in width, and poured a bucketful of water, boiling hot, all around the trunk of the tree, allowing it to remain in the trench. He states that it killed all of the borers present and that his trees, which had been covered at the base with gummy exudation and had been in very bad condition, rapidly improved and bore fine crops.

THE FAMILY PHYLLOXERIDÆ.

Dr. L. Dreyfus, in the "Zoologischer Anzieger," No. 316, 1889, has published a little statement to the effect that his new family which he had erected in his work entitled "Uber Phylloxerinen," Wiesbaden, 1889, should be given the "idæ" termination instead of the "inæ." He therefore gives as the four families of the suborder Phytophthires: (1) Coccidæ; (2) Phylloxeridæ; (3) Aphidæ; (4) Psyllidæ.

THE NEWLY IMPORTED ROSE SAW-FLY.

Mr. J. G. Jack refers in *Garden and Forest* of March 26, 1890, to the introduction of the European *Emphytus cinctus* into this country. He has found it feeding upon the roses in the Arnold arboretum at Cambridge in the summer of 1887 and succeeded in rearing the adult in the autumn of 1888. This species is from two to three times as large as a common Rose Saw-fly, has a white band around the body of the female, and is more active. The eggs are deposited singly on the under side of the leaf and there are two or three annual generations.

TESTIMONIAL TO MR. KOEBELE.

Hon. Ellwood Cooper, the president of the State Board of Horticulture of California, has suggested the raising of funds for the purpose of

presenting Mr. Koebele with a testimonial in recognition of his services in importing the insect enemies of the Fluted Scale, and we learn from the *Rural Californian* of April that the sum of $232.50 was raised during the recent convention at Los Angeles. The subsidiary statement which is being quite generally made and which has caused his friends no little anxiety, viz, that Mr. Koebele's health was ruined by his trip to Australia has, we are happy to state, no foundation whatever. Mr. Koebele writes that his health is perfect, and that he is good for three such trips, and it is due him to announce that the statement above-referred to and which has placed him in a false light, was started by secretary of the the State board of horticulture, upon his own confession, "for effect"!

A PARADOX.

It may seem very much like a contradiction in terms to speak of a white black scale, yet this is what we have recently received from Mr. Coquillett. In the midst of a normally colored colony of the Black Scale (*Lecanium oleæ*) on oleander he found a full-grown individual of a uniform perfectly white color. Mr. Coquillett considered this color to have been due to the fact that the specimen had recently molted, but so far as we know the Lecanii have no distinctive molts. It is probably an instance of albinism, and the first one of the kind which has ever come to our notice among the Coccidæ.

A RARE SPHINGID.

We have just received for the National Museum collection from Mr. W. G. Henry, of the U. S. Coast and Geodetic Survey, a specimen of the female of the rare *Pseudosphinx tetrio.* Mr. Henry gives us an interesting account of its capture, which we may quote:

The insect referred to was captured *at sea*, on January 19, while the *Blake* was at anchor on a current station in the Gulf of Mexico, about 160 miles south of the Mississippi River mouth, and about half way between the Louisiana coast and the Campeche Banks (Yucatan coast), I noticed the insect (I presume it was the same) sitting on the boom, under the awning, and tried to catch it, but it flew away as lightly and easily as a bird and took a straight westerly course across the sea until it was out of sight, and I saw it no more that day. The next day (January 20), I was sitting on deck and saw the insect (presumably the same) come in a straight course from westerly across the sea and alight on board, and, after repeated efforts, it was captured. The *Blake* had been at sea (out of sight of land) for six days, having left the Mississippi on January 13, and the insect was so shy and hard to approach that I think it could not have been on board the ship all that time without being disturbed and seen. For a week previous to its capture there had been no high wind from any direction which could have blown the insect off to sea, and it is therefore natural to suppose that its flight across the sea was entirely voluntary. I sent the insect to you from New Orleans on January 24.

On February 1 (I think) we again left the Mississippi and ran across the Gulf of Mexico to the Campeche Banks, and began to re-occupy the current stations, at intervals of 60 miles, on a line across the Gulf from Campeche Banks to mouth of Mississippi. On February 9 we arrived at and anchored on the same station where

the insect sent you was captured, and strange to state, while anchored there another of the same kind of insect came on board. It could be approached near enough to see that it was the same kind of insect, but it eluded every effort to capture it, and finally flew away across the sea. No other insect of that or any other kind had been seen anywhere in the Gulf, and it was rather strange that the only two seen should have been at the same spot, in the center of the Gulf of Mexico, and at an interval of twenty days.

A NEW APPLE PEST.

At a recent meeting of the agricultural bureau of this colony the secretary reported that he had noticed that many of the apples, in a shipment of ten thousand cases from California to Sydney, were perforated and tunnelled as though they had been attacked by the larvæ of the Codlin Moth. He had forwarded some of these to Mr. Frazer S. Crawford, as the matter was urgent, and the following report had been sent on by him to the commissioner of crown lands:

I have received from the secretary of the central agricultural bureau an apple stated to be one of a large importation from California, and which was supposed to be attacked by the codlin moth. On examination I found a number of small channels running through it in various directions, of an average diameter of about one-twentieth of an inch, in some places filled up with fine excreta. From these I extracted seven footless grubs, the largest about one-tenth of an inch long by rather more than half that in width. They are white, or else of a pale rose color, and have a white head. They are evidently the grub of a beetle; but of what species I am unable to say, as no mention of such an insect attacking the apple is made in any English or American work that I have got. I believe it to be a new pest to California, or only one that has only appeared there within the last year or two. If introduced here, I consider it likely to be as destructive as the codlin moth, and one equally as difficult to eradicate I therefore respectfully suggest that every endeavor should be made to trace this shipment of apples, and if possible that all found in the colony should be destroyed, and, furthermore, I wish to point out the advisableness of the other colonies being communicated with in order that the damage of the shipment may be pointed out.

MELBOURNE.

(Melbourne correspondence *Mark Lane Express*, February 17, 1890.)

AMERICAN VINES IN FRANCE AND THE PHYLLOXERA.

The gratifying showing of the rapid increase in the acreage of reconstituted vineyards in France, mostly by the use of American stocks, given in the last number of INSECT LIFE in the article entitled "The Phylloxera Problem Abroad, etc.," hardly leads one to expect the adverse report on the use of American vines given in the *Wine Trade Review* of February 15, 1890, and quoted in the Cape Colony *Agricultural Journal* of February 20.

The quotation is as follows:

An important movement is taking place in the department of Seine-et-Marne, in regard to the introduction of American *cépages* into the vineyards. Many people in France and other countries have been inclined to regard the grafting of French vines on American as one of the most certain methods of arresting the progress of the phylloxera; but it is clear that a different opinion is held in the Champagne country. The prefect of the Marne department last month directed that an inquiry should be

opened on the subject, and a few days later the *Syndicat du Commerce des Vins de Champagne de Reims* drew up an important document, in which its views as to American plants were fully stated. In the opinion of the *Syndicat* the introduction of these plants would be infallibly followed by the phylloxera, since they are the conductors and propagators *par excellence* of the pest, and though they may be able to support themselves against it, they rapidly spread it around them. Considering that a great danger is threatened to the vineyards, the *Syndicat* makes an energetic protest against the employment of the American plants, and copies of the document have been sent to the mayors of the seventy-nine communes of the Marne department, as well as to the prefect. The views of the *Syndicat* on such a question as this will doubtless receive the weight they deserve, and then go a long way to indicate the probable result of the inquiry.

A NEW AUSTRALIAN VINE PEST.

We have recently received from the author, through the State Department, advance proof of an article by Charles O. Montrose, editor *Victoria Farmers' Gazette*, relating to a new vine pest which is reported to be seriously ravaging the vineyards, orchards, and gardens of New South Wales.

In this article Mr. F. A. A. Skuse is recorded as stating that the insect in question is a species of plant bug, probably undescribed, belonging to the family Capsidæ, and from the description given, it must be closely allied to our Tarnished Plant-bug.

They are said to attack particularly the fruit-stems of the Grape, Plum, Apple, etc., causing the fruit to dry up instead of ripening. They seem to prefer Plum leaves, and are reported to leave the grape and other plants untouched in the neighborhood of plum trees. They are, however, practically omnivorous, causing great injury to all the common fruits, cereals, and vegetables.

Mr. Montrose has promised to forward specimens, on the receipt of which we may refer to the subject again.

TROUBLE IN CALIFORNIA.

In a recent account of the meeting of the Los Angeles County orange-growers we notice that the board of supervisors has received a petition signed by sixty-seven parties asking for the removal of the board of horticultural commissioners on the ground that spraying is injurious to the trees, and that parasites have been discovered which are effectively cleaning off the White, Red, Black, and San José scales. They claim that spraying kills off the parasites and leaves the scales to "pursue their chosen avocation."

We consider this action short-sighted and unjustified. Proper spraying will not injure the trees, and no effective new parasites of the Red, Black, or San José scales have been discovered. The parasite of the Black scale, discovered by Professor Comstock in 1880 (*Dilophogaster californica* Howard), was at that date considered by him a very effective enemy of this scale, and it is safe to say that, after ten years of uninterrupted work of the parasite, this scale insect is as abundant in California as ever.

Protoparce celeus Hb. (Tomato worm).—Well known as destructive to the foliage of both potato and tomato, but was last autumn observed eating into the fruit of the tomato, six individual tomatoes in one instance being destroyed on a single vine where growing foliage was abundant, but this was scarcely eaten. The trouble was first attributed to fowls and later to sparrows, but both were proven innocent by the worms being surprised in the act.

Daremma catalpæ Bd. (Catalpa Sphinx).—Besides being exceedingly abundant, and the larvæ very destructive to young Catalpa trees in southern Indiana, I have found the larvæ also defoliating trees in the forests of Arkansas in May. Mr. John B. Smith, in his recent monograph of the Sphingidæ,* does not include territory west of the Mississippi River as within the distribution of this species.

Spilosoma virginica Fabr. (Yellow Woolly-bear).—The caterpillar was observed eating holes in ripe muskmelons at La Fayette, Ind., October 15. In one instance an excavation had been made in an otherwise perfect melon, over an inch in diameter, and fully half as deep.

Mamestra legitima Grt.—Adult moth reared during spring of 1889 from larva found feeding within seed pod of *Asclepias incarnata* near La Fayette, Ind., early in November, 1888. The larva appeared to subsist upon the seeds, the pod being attached unopened to the erect plant.

Prodenia lineatella Harv.—Nearly full grown larvæ observed at La Fayette, Ind., October 29, 1888.

Scoliopteryx libatrix L.—Adult moths reared at La Fayette, Ind., September 24. Parasite, *Ophion purgatum* Say, emerged from pupæ of this species October 29.

Aletia xylina Say (Cotton worm).—Adults captured in a large field of red clover near La Fayette, Ind., from about August 20 to October 15, 1889.

Phycis indiginella Zeller (Leaf crumpler).—From a large number of larval cases, collected late in February and placed in warm quarters, there emerged on March 7 two species of parasites, *Hemiteles variegatus* Ashm. and an undescribed species (No. 1092*a*) of *Apanteles*.

Plutella cruciferarum Zeller (Cabbage Plutella).—This pest of the cabbage appeared in some of the market gardens about La Fayette, Ind., during May, 1889, and did serious injury. The moths emerged in great abundance late in May, and about the 10th of June there appeared great numbers of parasites—*Phæogenes discus* Cress.

Wilsonia brevivittella Clem.—Adults of this species were reared from seed pods of Evening Primrose, *Œnothera biennis* L. The larvæ depredate upon the seed pods much as those of *Pronuba yuccasella* Riley do in the seed pods of the Yucca. The larvæ were first observed early in September. The exact date of appearance of moths was not noted, but it must have taken place very late in September, or during October.

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* Trans. Am. Ent. Soc., Vol. XV, p. 205.

Callosamia promethea Drury.—The larvæ of this species was very abundant during the season of 1889, and the cocoons were to be found on wild cherry and sassafras in great numbers. Examination of these cocoons in March, 1890, developed the fact that fully two-thirds of them had been parasitized by *Ophion macrurum* Linn.

Agrotis herilis Grote (Western Striped Cut-worm).—In company with other cut-worms, this species is supposed to descend into the earth in the fall for the purpose of hibernating. The winter of 1889–'90, however, proved an exception, and the larvæ, usually about one-fourth to one-third grown, were observed on warm, sunny days during the entire winter feeding above ground upon young wheat in the field, and also upon grass in meadows and other grass lands.

Hadena stipata Morr.—On page 134, Volume II, INSECT LIFE, this species was incidentally mentioned as destroying young corn on newly broken grass lands. Since that notice was written reports of serious depredations have come to me from Clinton, Miami, Madison, and Johnson Counties, Ind., all indicating that this is the most destructive of all our cut-worms in the localities where it occurs; some fields being totally ruined, and that, too, after it is too late in the season for replanting. Both low and high lands, timothy and clover sod, seem alike attacked, even though the ground may have borne but one previous crop of grass or clover.

Lithophana antennata Walk.—Possibly on account of the extreme mild winter just passed these moths made their appearance very early in the season, several being captured at La Fayette, Ind., on the evening of February 24, 1890.—[F. M. Webster, March 29, 1890.]

THE PUNCTURING OF APPLES BY THE PLUM CURCULIO.

In a foot-note to Mr. Webster's article upon "Experiments with Plum Curculio," published on page 308 of the last number, we promised to publish in a future number the figure illustrating the condition of

FIG. 71.—Plum Curculio punctures in young apples—natural size (original).

young apples found by Mr. Webster July 24, at La Fayette, Ind., and which illustrated a severe attack of the adult of the Plum Curculio.

The tree from which these apples were picked blossomed profusely and produced a good crop of young apples, but by July 24 all but two dozen had fallen to the condition of this. The figure is drawn from specimens picked on that date and sent in by Mr. Webster, and very well illustrates the work of the Plum Curculio, as we have often witnessed it as much as twenty years ago.

THE VEDALIA IN NEW ZEALAND.—RECENT INCREASE OF ICERYA.

* * * Going back to Vedalia. All parts of New Zealand have been importing plants from Australia for very many years, particularly Citrus and Acacia. Auckland was the first visited by Icerya, which was discovered on an imported plant (*Acacia undulata*), but I am not prepared to say the *individual* plant was imported. It is rather singular that in some districts it appeared first on Australian acacias (plants it seems even more partial to than Citrus, although it is not so rapidly fatal to them), *plants grown from seed* being the first attacked in districts. Auckland was also the first district cleared by Vedalia, and then Takapuna, Wairoa, South Waikomiti, etc., where the Citrus and other plants *were derived from Auckland.* Auckland was cleared so rapidly that no one knew how, till it was over, and it would have also remained a mystery with the other places had I not heard of it and gone there to find the cause. Napier and Nelson are the other two infested parts, and they import direct from Australia *and separately.*

At Napier they received the beetle later than Auckland, but at Nelson they have missed it, and up to the present time the Icerya *is going on unchecked.* I urged them to procure the beetle from Napier while it was yet time, and Mr. Maskell got them the Lestophonus flies (which have done no good). Hamilton sent them the beetles, but Mr. Maskell wrote to me a few posts ago to say that it was doing no good and did not seem to increase. The fact is I feel sure he has sent them the *wrong* insect. It is deplorable to see people making such mistakes and no properly qualified person to set them right. There is one thing I must beg to draw your attention to, and that is, that in my late tour round the North I find (as might be expected) Icerya *returning everywhere* and not a trace of Vedalia; in many places, and around Auckland in particlar, it is increasing fast and bids fair to become as bad as ever. This should warn you to take care of Vedalia and conserve a few colonies; the reason is very obvious. * * * —[R. Allan Wight, Paeroa, Auckland, New Zealand, March 15, 1890.

THE PHYLLOXERA IN NEW ZEALAND.

* * * I am ashamed to say that our Government has positively refused to permit me to land any vines from the United States under any circumstances, for fear of importing *Phylloxera vastatrix*, of which a

fine specimen now stands before me in a bottle. I have just come home from a tour round the North, and I have seen it in two vineyards in our principal grape-growing country. I am disgusted. One man dug up the vines and burned them as soon as he was aware of it. The other refused unless his neighbors would pay him £10. What can I do for such a people as this? Maskell is advising the Government to compel all vine owners in infected districts to burn their vines, whether they are infected or not (the insect could do no more). I am advising them to severely punish people who refuse to burn infected vines, when it has once been pointed out to them, and to either compel or encourage others to shift on to proof roots. * * *—[R. Allan Wight, Paeroa, Auckland, New Zealand, March 15, 1890.

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Number 4 of Volume I of the Proceedings of the Entomological Society of Washington has just been published. This number is furnished with an index to the whole volume which it completes. It contains about 100 pages and includes, among the shorter notes, papers by Mr. Schwarz, on the Coleoptera common to North America and other countries; notes on the comparative vitality of insects in cold water; stray notes on injurious insects in tropical Florida; notes on the Tobacco Beetle (*Lasioderma serricorne*); notes on *Cicada septendecim* in 1889; food plants and food habits of some North American Coleoptera; Myrmecophilous Coleoptera found in temperate North America, and sudden spread of a new enemy to clover (*Sitones hispidulus*); by Mr. Howard, note on the hairy eyes of some Hymenoptera; note on the mouthparts of the American Cockroach; authorship of the Family Mymaridæ, and a few additions and corrections to Scudder's Nomenclator Zoölogicus; by Mr. F. V. Coville, notes on Bumble-bees; by Judge L. C. Johnson, the Jigger Flea in Florida; by Mr. Marlatt, swarming of *Lycæna comyntas;* an ingenious method of collecting Bombus and Apathus, and abundance of Oak-feeding Lepidopterous larvæ in the fall of 1889; by Baron Osten Sacken, correction to the monographs of the Diptera of North America, Vol. I, 1862; by Mr. Ashmead, some remarks on South American Chalcids; an anomalous Chalcid (*Hoplocrepis* n. g., *albiclavus* n. sp.), and remarks on the Chalcid genus *Halidea;* by Mr. Townsend, notes on some interesting flies from the vicinity of Washington, D. C.; on the fall occurrence of Bibio and Dilophus, and a further note on *Dissosteira* (*Œdipoda*) *carolina;* by Professor Lugger, on the migrations of the Milkweed Butterfly. In addition to these are many shorter notes by Professor Riley, Dr. Marx, Dr. Fox, Mr. Mann, and others.

The first volume, being now complete, may be obtained from the corresponding secretary of the society, Mr. Tyler Townsend, Department of Agriculture, Washington, for $3.

AN ACKNOWLEDGMENT.

In the March number of INSECT LIFE (p. 290), is a notice of my paper in *Garden and Forest*, on *Zeuzera pyrina*, which makes it necessary to credit the observations to those who gave them to me for use. The figures used were drawn by Mr. C. P. MacChesney, of Arlington, N. J., and were simply put into shape for engraving by me. Mr. Angelman found the larva, and the facts used all came to me from these gentlemen. Mr. MacChesney published his own observations in *Ent. Amer.*, VI, No. 2, and this paper must be credited as the scientific presentation of the matter rather than my popular account to which accident alone gave a date not intended and an apparent priority which it does not deserve.—[John B. Smith, Rutgers College.

THE GENITAL ARMATURE IN MALE HYMENOPTERA.

General Radoszkowski, at the meeting of the French Entomological Society, of September 11, 1889 (see Bulletin Entomologique, p. clxxii), presented a communication on the subject of the use of the male genital armature in Hymenoptera for the separation of species. Following in the line of the investigations of Dufour, Sichel, Fred. Smith, and E. Saunders, and adopting in the main the nomenclature of Dufour, and has found that these parts are of great value in the distinction of species, as they have proven to be with other orders. He has applied this method of diagnosis to more than 40 genera and 500 species. He has expressed himself as of the opinion that of all characters known among the Hymenoptera the form of the genitalia is the surest and most stable for generic and specific characters as well as for varieties. The forms examined seem to belong mainly to the *Anthophila*, *Mutillidæ*, and *Chrysididæ*.

THE MAN INFESTING BOT.

At the 27th of March, 1889, meeting of the French Entomological Society Mr. Émile Gounelle exhibited a larva taken from a man who came from Brazil, and stated that similar cases were not rare, particularly around St. Paul. Mr. Laboulbène added that he had also observed a similar larva taken from a Brazilian woman recently arrived in Paris. It was taken from a painful tumor and recognized as a species of *Dermatobia*. It was placed in a breeding cage, but died before transformation.

THE EGGS OF ATHERIX.

Mr. J. E. Ives, in the March number of *Entomological News* (p. 39), describes a mass of eggs taken from the under surface of a tree overhanging a small stream, which was determined by Dr. Williston as those of the Leptid genus *Atherix*. The same thing has recently been figured and described in England, and certain egg-parasites are also figured. Some thirteen years ago we collected a large number of these eggs upon

the piling of Lake Minnetonka, near Minneapolis, and they have formed an interesting part of the Dipterological collection of the National Museum, while more recently we received a bit of piling from the shores of Lake Ontario which were covered with these eggs from which larvæ hatched which we were able to determine as belonging to this genus by comparison with the figures in Dr. Brauer's Monograph of Dipterous larvæ. Our correspondent stated that the wharf piles for hundreds of feet were covered with these eggs.

A MONOGRAPH OF THE EVANIIDÆ.

An important monograph of the family Evaniidæ has been completed by August Schletterer and published in three parts in the *Annalen des K. K. Naturhistorischen Hofmuseums*, Volume IV. Parts I and II bear the date 1889 and part III 1890. The species of the entire world are described by means of analytic tables and lengthy descriptions, and the synonomy is most carefully considered. The monograph is illustrated with 6 lithographic plates of morphological details. He places only the three genera *Evania* Fab. (*Brachygaster* Stephens, *Hyptia* Shuckard), *Gasteruption* Latr. (*Fœnus* Walk., and other authors), and *Aulacus* Jur. (*Aulacostethus* Philippi and *Pammegischia* Prov.) in the family Evaniidæ. The work as a whole is one of the most thorough and complete monographs which we have seen.

COLONEL PEARSON ON THE ROSE CHAFER.

In the article on the Rose Chafer, on page 295 of the last number, we neglected to make mention of an excellent article on this insect by Col. A. W. Pearson in the January 22 number of *Garden and Forest*, in which he states that subsequent experiment with Bordeaux mixture showed that it was not the specific which he formerly considered it to be. Last summer he made a solution of 1 ounce of good Pyrethrum to 2 gallons of water, first wetting the powder to a paste before mixing with all the water. On spraying the vines with this mixture the bugs became paralyzed and fell to the ground. Then he had men pass along both sides of the trellis and jar the vines and kill the bugs with paddles. Insect powder in this strength he finds does not kill them, but only temporarily stupefies them, and they will eventually recover and fly away. Meanwhile they will be quite easily destroyed for some time. As the testimony of a practical man this is of value.

THE COLUMBUS HORTICULTURAL SOCIETY.

We have been favored with No. 1, Volume V, of this Society, which contains some interesting entomological matter. The principal article is by Prof. D. S. Kellicott on "Our Injurious Ægerians." He gives a short account of thirteen species and illustrates upon a well executed plate the Peach Tree-borer, the Pear Tree-borer, the Imported Currant-borer, the Maple Tree-borer, and the Plum Tree-borer.

MR. BUCKTON'S MONOGRAPH OF THE BRITISH CICADÆ AND TETTIGIIDÆ.*

The mere announcement that Mr. G. B. Buckton was about to monograph the British species of the difficult group of insects above mentioned, was a sufficient indication that the work would be well and carefully done, and the two parts which we have before us fully justify our anticipations. The work resembles in character his well-known monograph of the British Aphididæ, although not published as was the former work by the Ray Society. The plates are drawn and lithographed by Mr. Buckton himself, and while a little rough in appearance admirably illustrate the characteristics of the different species. The parts contain 32 pages and 10 plates each, all of the plates being colored except two supplementary ones which indicate details of structure.

EARLY STAGES OF THE ODONATA.†

After many years Mr. Cabot has given us the third part of his monograph, which takes up twenty-three species of Cordulina with a number of forms in the genera Pantala and Tramea. The six lithographic plates are beautifully reproduced from drawings by the author.

INDIAN MUSEUM NOTES No. 3.

The third number of these insect publications has just reached us through the courtesy of Mr. E. C. Cotes. This number is devoted to a description of the "Silk-worms in India," and a surprising number of species actually reared for commercial purposes are treated. Aside from the Mulberry Silk-worm (*Sericaria mori*), the pamphlet considers *Bombyx fortunatus*, the *Desi* or *Chota Polo; Bombyx crœsi*, the *Nistry* or *Madrassi; Bombyx arracanensis*, the *Nya Paw; Bombyx sinensis*, the *Sina*, *Cheena*, or *Chota Pat; Antheræa mylitta*, the *Tusser; Attacus ricini*, the *Eri; Antheræa assama*, the *Muga*. Four lithographic plates accompany the treatment of the species.

THE CHINCH BUG DISEASE.

Prof. F. H. Snow, in No. 1 of Volume XII of the Transactions of the Kansas Academy of Sciences (1889), pages 34 to 37, gives the result of his experiments for the artificial dissemination of a contagious disease among the Chinch Bugs. There is little further in this article than that summarized from the *Lawrence* (Kans.) *Daily Journal* on page 126 of the current volume. We repeat our caution as to the too ready acceptance of results of this character.

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* Monograph of the British Cicadæ and Tettigiidæ, illustrated by more than 400 colored drawings by George Bowdler Buckton, F. R. S. London, Macmillan & Co., and New York, 1890. 8 parts. Price, 8s. per part.

† The Immature State of the Odonata. Part III. Subfamily Cordulina. By Louis Cabot, with 6 plates. Memoirs of the Museum of Comparative Zoölogy, Vol. XVII, No. 1, Cambridge, February, 1890.

STUDY OF THE BIRD LICE.

Mr. Vernon L. Kellogg, in No. 1, Volume XII of the Transactions of the Kansas Academy of Sciences (1889), pages 46 to 48, announces that he has noted and described twenty-four species of Mallophaga representing ten genera taken from Kansas birds. Among these are two new genera. He publishes a figure of *Tetrophthalmus* showing the respiratory system and gives a table of the genera. He has not named his new species, but has given them numbers. We see from this notice, that Mr. Kellogg has gone at this work in the right way, and we hope he will continue his studies.

THE TROPICAL SUGAR-CANE BORER IN LOUISIANA.

Never before have complaints of the tropical cane-borer been so pronounced over so extensive a territory as the present season. It is to be feared that, should the winter prove an open one, they may do very serious damage to the next crop. In 1857 they were so abundant along the lower coast as to have about destroyed the crops on one or two plantations. They again appeared in the same locality, and in Assumption and St. Mary, in large numbers, in 1880, after the open winter of 1879. They attack sorghum and corn in the same manner as cane, and are known near the coast throughout the Gulf States. The moth is of a light, grayish brown color, with about $1\frac{1}{4}$-inch spread of wings. This lays its eggs upon the leaves of the cane, near the axils, the young borers hatching in a few days. The borer penetrates the stalk at once, usually just above a node, working upward through the soft pith. The full grown borer is about 1 inch long, slender, cylindrical, and cream white in color, with yellow head and black mouth. Several broods are hatched in the course of a season. It is believed to hibernate almost exclusively in the larva or worm state. Those which find shelter in the stubbles, discarded tops and seed cane, alone escape destruction during the harvest of the crop. Fortunately, few are found to burrow near the extreme butt of the cane. If cut at the surface of the earth very limited numbers will, therefore, be preserved in the ratoons. A speedy burning of the tops, after removal of the crop from the ground, will destroy those which would be carried over to the next season by these. An immediate plowing under of all tops seems the next best alternative, but undesirable. They certainly should not be allowed to remain on the surface of the ground until warm spring weather.

Borers present in seed cane are not so easily dealt with. It is probable that from canes planted in the autumn and rolled the moth is unable to escape. The same is true in less measure of seed put down in windrow, if as heavily dirted as is compatible with the canes' safety. This should be dropped and re-covered as soon after removal from windrow in the spring as possible. Mats, both flat and round, are especially to be avoided for affected canes. It will be safest in all cases to put down as seed such canes as are least attacked. No abandoned forage sorghum should be allowed to go over the winter and corn

stalks should also be plowed under, or be otherwise destroyed before winter is past. To neglect these precautions may be ruinous. There are, perhaps, more borers now in your field than you suspect.—[W. J. Thompson in *The Louisiana Planter*, Nov. 2, 1889, Vol. 3, p. 274.—The insect is probably *Chilo saccharalis.*

IMPORTATION OF HESSIAN FLY PARASITES.

With the assistance of Mr. Fred Enock, of London, England, we hope to import during the summer some living specimens of *Semiotellus nigripes*, a Russian parasite of the Hessian fly, in order to endeavor to acclimatize it in this country. Mr. Enock is rearing it extensively and hopes to be able to send us a good supply.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

April 3, 1890.—Mr. B. E. Fernow was elected an active member of the society.

Mr. Fox read a paper on a small group of spiders forming the subgenus *Ceratinella* of the genus *Erigone*. The subgenus includes about seventeen species distinguished by the presence of a shield on the abdomen. All the specimens were collected east of the Alleghanies by Messrs. Marx and Fox, and were found fully developed at all seasons of the year. The paper was illustrated with drawings and a collection of the spiders was shown. Discussion followed by Messrs. Marx and Fox.

Mr. Schwarz read a paper entitled "Labeling Specimens," in which he described the systems of labeling employed in the case of entomological collections, dealing particularly with the systematic collection of the specialist. The various labels employed were described and examples of some of them were shown. The paper called forth considerable discussion which was participated in by Messrs. Riley, Mann, Schwarz, Marx, and Fox.

May 1, 1890.—The committee having in charge the preparation for publication of a list of the insect fauna of the District of Columbia made a partial report, which was discussed at length.

The name of Mr. Townsend was added to the subcommittee on Diptera, and that of Mr. Marlatt to the subcommittee on Hymenoptera.

A revision of the subcommittees will be made at the next meeting.

Mr. Townsend read a list of eighty-seven species of Heteroptera collected by him in southern Michigan, with some brief notes and dates of occurrence. One species, *Corimelæna nitiduloides* Wolff, was taken in a nest of *Formica schaufussi* Mayr.

Mr. Townsend also presented a paper on "Some insects affecting certain forest trees," mostly from Michigan, recording upwards of a hundred Coleoptera and a few of other orders, affecting either the foliage or the sound or decaying trunks of oak, hickory, elm, beech, linden, butternut, iron-wood (*Carpinus*), willow, hazel, etc.

These papers were discussed by Messrs. Schwarz and Riley.

Mr. Dodge read a paper on Artificial Silk, describing the Count de Chardonnet's method, as exhibited at the late Paris Exposition, of making from cellulose a substance closely resembling silk. A detailed account of the process of manufacture was given, illustrated with a figure of the device for producing the thread, and a sample of the silk was exhibited.

Discussion followed by Messrs Philip Walker, Riley, Amory Austin, and others.

Mr. Marx presented some "Arachnological notes" in which he discussed the comparative anatomy of the spinning glands of spiders. The relation of these to the external spinning organs or spinnerets and the importance of both in classification were explained. Careful drawings of the parts discussed were shown.

C. L. MARLATT,
Recording Secretary.

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ERRATA.

Page 21, line 18 from bottom, read *Phylethus* for *Philetus.*
Page 26, line 23 from bottom, read 1859 for 18 9.
Page 47, line 9 from bottom, insert a colon after these.
Page 52, line 25 from bottom, read Hagen for Hagan.
Page 53, line 17 from bottom, omit of.
Page 55, line 11 from top, add (*Pseudopulvinaria*), after genus.
Page 55, line 12 from top, read *incana* for *incarna.*
Page 55, line 12 from top, read *Castanea indica* for *Castania india.*
Page 57, line 18 from top, read The Coccinellid beetles for These beetles.
Page 57, line 14 from bottom, read Trichopterygid beetles for Caddis flies.
Page 58, line 8 from top, read *Ptiliolum* for *Pteliolum.*
Page 66, line 14 from top, read *Melanoplus* for *Melanopus.*
Page 68, line 21 from top, read *Sarcophaga* for *Sarcophoga.*
Page 70, line 13 from top, read *Vedalia* for *Vedolia.*
Page 71, line 16 from top, read *Vedalia* for *Vedolia.*
Page 73, in explanation of figure, read *Vedalia* for *Vedolia.*
Page 78, line 10 from bottom, read Nuttall for Nuttal.
Page 83, line 3 from bottom, read *nigripectus* for *nigrifectus.*
Page 90, line 8 from top, read Camellias for Camelias.
Page 90, line 8 from top, read *filifera* for *fillifera.*
Page, 91, lines 14 and 8 from bottom, read *Cryptochætum* for *Cryptochœtum.*
Page 92, line 17 from top, read Division for vision.
Page 101, line 11 from bottom, read genal for genial.
Page 101, line 11 from bottom, read foveæ for foviæ.
Page 102, line 22 from bottom, read flies for fles.
Page 108, line 1 from top, read *herculaneus* for *herculeanus.*
Page 108, line 16 from top, read main source for mains ource.
Page 112, line 15 from top, read *Rhyssematus* for *Ryssematus.*
Page 112, line 18 from bottom, read *Vedalia* for *Vedolia.*
Page 116, line 5 from bottom, read fasciæ for fascia.
Page 117, line 19 from top, read belongs for belong.
Page 119, line 19 from top read *Amphicarpæa* for *Amphicarpaæ.*
Page 120, center column, line 20 from top, read *Coryliella* for *Caryliella.*
Page 123, line 6 from bottom, read *sericeum* for *sericorne.*
Page 126, line 1 from top, read Entomophthora for Entomopthora.
Page 126, line 9 from top, read Entomophthora for Entomopthora.
Page 127, line 7 from top, read Entomophthora for Entomopthora.
Page 127, explanation of figure 19, *b*, read pupa within larval skin, for larva, ventral view.
Page 128, line 17 from top, omit "and *b* from below."
Page 128, line 20 from bottom, add after "larva," as shown at *b*.
Page 132, line 13 from bottom, read *Phragmites* for *Phragnites.*
Page 138, line 9 from bottom, read Fig. 22 *p.* for Fig 22 *r.*
Page 147, line 23 from bottom, read "Sattelmücke" for "Sattlemarke."
Page 151, line 18 from bottom, read clear for clean.
Page 154, line 1 from bottom, read *Gelechia* for *Galechia.*

Page 155, line 5 from top, add Chambers after IDE.
Page 167, line 4 from top, read *Ephestia* for *Ephestea.*
Page 182, line 12 from top, read they can not be recommended, for they can be recommended.
Page 192, line 15 from bottom, read elliptical for ellipticle.
Page 193, line 15 from bottom, read The Five-ribbed Tea-mite for Five-legged Tea-mite.
Page 193, line 21 from bottom, read *bioculatus* for *biaculatus.*
Page 195, line 1 from top, read hymenopteron for hymenopteran.
Page 209, line 4 from bottom, read Azalea for Azalia.
Page 211, line 11 from top, read 5 for 13.
Page 211, line 12 from top, read 8, 9, and 10, for 14, 15, and 16.
Page 226, explanation of figure, read from for rfom.
Page 253, line 18 from bottom, read naphtha for naptha.
Page 259, line 16 from bottom, read springtails for neuropters.
Page 259, line 13 from bottom, read *rubigo-vera* for *rubigovera.*
Page 261, line 10 from bottom, read *ludens* for *lugens.*
Page 264, line 6 from top, read "Fangpflanzen" for "Fangenpflanzen."
Page 271, line 17 from bottom, omit comma after infests.
Page 272, line 4 from bottom, read *rosæ* for *roseæ.*
Page 277, line 12 from top, read fuchsias for fuschias.
Page 280, line 20 from top, read Borkenk. for Borkask.
Page 280, line 16 from bottom, read *scutellaris* for *scutellatus.*
Page 280, line 4 from bottom, read *Gortyna* for *Gortina.*
Page 283, line 1 from top, add of 1889, after Season.
Page 283, line 12 from bottom, read *Eudioptis* for *Endioptis.*
Page 283, line 9 from bottom, read Treitschke for Treitshke.
Page 283, line 6 from bottom, read *malefida* for *malepida.*
Page 302, line 17 from top, insert palpi after labial.
Page 303, line 5 from top, read longius for longuis.
Page 312, line 19 from top, read welfare for wefare.
Page 313, line 7 from top, read parasitic for parisitic.
Page 322, line 7 from top, insert Type before TISCHERIA.
Page 323, line 23 from bottom, read grateful for greatful
Page 328, line 15 from bottom, read *pastinaceæ* for *pastinacæ.*
Page 329, line 3 from bottom, read Chrysopas for Chrysopus.
Page 330, line 8 from bottom, read *Gracilaria* for *Gracillaria.*
Page 360, line 3 from top, read Rhinebeck for Buffalo.
Page 366, line 5 from top, read 70 for 60.
Page 371, line 13 from bottom, read 31 for 21.
Page 379, line 11 from top, transpose first the to beginning of line.
Page 383, line 11 from bottom, read *Lithophane* for *Lithophana.*
Page 390, line 5 from top, omit probably.